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ABSTRACT

This handbook is designed for use by educators, parents, and computer professionals who can utilize it for special assistance; for locating appropriate, relatively inexpensive, quality materials; and for developing an awareness of the broad spectrum of tasks that are essential to the effective use of computers in schools. The first seven chapters deal with relevant, specific topics: (1) technology program development; (2) curriculum development; (3) staff development; (4) software selection; (5) hardware selection; (6) computer facilities planning; and (7) budgets and funding. Each chapter first presents an overview of the topic, then a checklist, and is followed by an extensive list of resources. Chapter 8 focuses on resources for professional support and expands the previous lists of resource materials by topic area with a selected guide to national organizations, technical organizations, state level educational technology specialists, and periodicals. The handbook concludes with a glossary of computer terms and a subject index. (CGD)

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PLANNING FOR COMPUTERS IN EDUCATION

A RESOURCE HANDBOOK

Prepared for
The Technology in Education Committee
of the
American Federation of Information
Processing Societies

By
Northwest Regional Educational Laboratory
Technology Program
Anne Batey, Editor

1986, Revised 1988

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Copies of this handbook can be ordered for $23.90 from:

Northwest Regional Educational Laboratory
Office of Marketing
101 S.W. Main Street, Suite 500
Portland, Oregon 97204

This handbook was originally prepared in 1986 and has been updated in 1988.

INTRODUCTION

The goal of this book is to put into the hands of educators, administrators, parents and computer professionals a resource book for locating appropriate, relatively inexpensive, quality materials for use in schools.

Many important concerns must be addressed if computers are to be used effectively in schools. Educators, parents and computer professionals can utilize this book to develop an awareness of the broad spectrum of tasks that are essential to the effective use of computers. Further, the reader will obtain special assistance and sources of materials to assist teachers, students, administrators and others in furthering the effective use of computers in schools.

The text was prepared for the Technology in Education (TIE) committee of the American Federation of Information Societies (AFIPS) by the Northwest Regional Educational Laboratory (NWREL). A subcommittee of the TIE committee assumed the primary responsibility for preparing the outline for the resource book and working with NWREL throughout the development of this book. This committee, Robert Eicholz, Gerald Engel, Elizabeth Phillips Jensen, and Doris K. Lidtke, deserve special thanks for the many, long, weekend hours spent on this portion of the project. Special acknowledgment should go to Anne Batey and Donald Holznagel from NWREL for the fine job they did in preparing this book and working with the committee.

The entire TIE committee devoted considerable effort to the development of this book. The committee members are: Bruce Burt, Michael Cady, James Cretsos, Sylvia Charp, Robert Eicholz, Gerald Engel, John Gosden, David Hanum, Elizabeth Phillips Jensen, Ralph Jones and Doris K. Lidtke. The committee received excellent support from many members of the AFIPS staff, especially Diane Edgar, Kaylee Jennings and Kathy Potts.

Special thanks are due to Sylvia Charp who conceived the idea of an AFIPS project involving computer professionals working with educators to enhance the use of technology in the schools of the nation. The executive committee of the Education Committee of AFIPS: Gerald Engel, Ted Sjoerdsma, and Doris K. Lidtke, gave informed advice and reviewed the material. Finally, this book would have been impossible without the encouragement and financial support of the AFIPS Board.

Doris K. Lidtke
Chairperson, TIE
Project
Baltimore, Maryland
March 5, 1987

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1. TECHNOLOGY PROGRAM DEVELOPMENT

OVERVIEW

A good technology program follows a development cycle that begins with careful planning before moving to an implementation stage. Once a program is implemented, it is maintained with ongoing review and modification. Given the rapid rate of change in instructional technology, the three stages become a cycle as the maintaining stage returns to planning for another new application of technology.

This opening chapter is a brief overview of a suggested process for developing a technology program. While individual steps in the process are presented in somewhat sequential order, many may best be carried out together or continued throughout the cycle. A general checklist of steps follows the opening section that describes the development process. Many of the resources listed in the final section are very useful because they provide samples of items to use in developing your own technology program.

Planning

Identify needs. It is helpful to begin by determining the existing resources, human and physical, available in your district. The results of surveys and inventories will identify the district's technology needs and support initiating the program. Surveys of staff, students, parents, and community members will provide information on needs, interest-level, expertise with technology, and existing technology. In addition to important background information, the survey process will inform and involve people with program development. Inventories will provide information on amount, kind, and location of software and hardware in the district.

Organize a technology committee. A technology committee provides leadership and makes decisions for the technology program development. Typically, several subcommittees are formed within the technology committee and are assigned task areas.

One suggested subcommittee structure has a head steering committee and four subcommittees:

- Curriculum
- Staff Development
- Hardware and Software
- Organization and Implementation

Another structure used by a school district has six subcommittees within their Computer Policy Committee:

- Professional Development
- Curriculum Development
- Student/Parent Issues
- Management/Administration
- Hardware Procurement
- Maintenance and Security

Technology committee members include representative staff from all grade levels and subject areas. It would be helpful to include technology specialists on the committee. Students, parents, and community members should also be included in at least an advisory capacity. A committee member need not be a computer expert but must be genuinely interested in participating. Technology committee and subcommittee chairpersons are chosen for leadership skills as well as expertise with technology.

Technology committee tasks: providing program structure. Technology committee tasks that provide structure for the technology program might include preparation of the following:

- a statement of philosophy
- broad program goals
- short-term goals
- program development priorities
- district policy statements
- implementation timelines

The efforts of the technology committee on these tasks should result in a formal report (or reports) that communicate the district's technology plan.

A statement of philosophy establishes your district's approach and direction for the technology program. It often includes a list of principles defining the district's stance on issues like equity. Broad program goals will define what the program proposes to accomplish. These goals may need to be prioritized and differentiated by grade levels, e.g., improvement in basic skills for upper elementary having a higher priority over increased student motivation. High priority goals will be emphasized when laying out implementation timelines. The technology committee may also be responsible for drafting policy statements. For example, policy statements might include: the technology committee membership and tasks, hardware and software purchasing, copyright, etc.

Technology committee tasks: planning the program components. The technology committee tasks will include planning for the various components that make up the technology program:

- computer curriculum development
- staff development
- software and hardware selection
- the computer facility
- the budget and funding

Planning in these five areas is closely related. First, prioritized program goals form the basis for curriculum development. The resulting curriculum decisions determine the software purchases. The selected software affects the hardware decisions and to a certain extent the computer facility. A staff development plan must consider the curriculum as well as the hardware and software purchased. Finally, they are all affected by the constraints of the budget. Each of these technology program components: curriculum, staff development, software, hardware, computer facilities, and budget are covered in a separate chapter of this handbook.

To prepare for implementing the program, the technology plan must include procedures and personnel for coordinating the technology program. It is common to designate a computer coordinator to manage the program. Some large districts designate several computer coordinators with district-level or building-level responsibilities. Sometimes the media-specialist becomes the building-level computer coordinator. A computer coordinator is a generalist comfortable with managing all components of the program. The chapter on staff development contains information on such staffing considerations.

Implementing

The implementation stage of a technology program includes: acquiring and installing software and hardware, conducting initial staff orientation and training, and continued work on curriculum development. These activities are covered in separate chapters.

A critical component of implementing a program is communication. A well-informed staff and community is more likely to stay involved and committed to the program. Some suggestions for communicating program activities include:

- publish a regular newsletter
- prepare press releases for the local newspaper
- invite computer users in the community to speak in classrooms
- install a suggestion box near the computer facility
- schedule a technology open house

Maintaining

To a certain extent, informal revision of your technology program will begin as soon as various components are implemented. For example, staff training may proceed more slowly or along different routes than originally planned. Or, the availability of new courseware may change a curriculum decision. But at some point, formal review or evaluation of your program should be integrated into the development cycle. The evaluation process will give important information on the progress of the technology program. It need not be a rigorous research effort but should attempt to cover all components of the program. Carefully designed surveys, questionnaires, and interviews are appropriate for gathering useful information from program leaders, staff, and students. As the program grows, accountability will become a concern and student achievement may need to be verified with testing. Tests for computer literacy and computer science exist but are not common and may have to be developed for your needs.

Once the evaluation results are compiled, existing plans and associated documents will need to be revised and updated. Obsolete hardware and software will need to be replaced or relocated and given different functions. Facilities may need to be remodeled to accommodate upgrades in hardware.

CHECKLIST

Planning

Notes

_________ 1. Identify Needs

- Conduct surveys
  - staff
  - students
  - community members
- Inventory existing resources
  - staff expertise
  - courseware
  - hardware

_________ 2. Organize a Technology Committee

- Define subcommittees
- Identify members
- Appoint leaders

_________ 3. Technology Committee Tasks: Program Structure

- Prepare statement of philosophy
- Determine program goals
- Define program development priorities
- Prepare policy statements
- Develop implementation timelines and procedures
- Present plans in a formal document(s)

_________ 4. Technology Committee Tasks: Program Components

- Plan computer curriculum
- Develop software acquisition process
- Develop hardware acquisition process
- Plan staff development program
- Plan program management
- Plan the facility
- Determine budget and funding sources

Implementing

Notes

__________ 1. Communicate program plans and activities
- Newsletters
- Press releases, etc.

__________ 2. Conduct initial staff orientation

__________ 3. Conduct staff training

__________ 4. Install hardware and software

__________ 5. Develop curriculum for computer integration

__________ 6. Involve parents and community

Maintaining

__________ 1. Conduct ongoing staff development

__________ 2. Conduct program assessment and review

__________ 3. Review and update policies, plans, and goals

__________ 4. Upgrade equipment and facilities

__________ 5. Continue community involvement efforts

__________ 6. Maintain ongoing communications
- Newsletters
- Press releases, etc.

RESOURCES

Planning Guides

Administrative Policies for Increasing the Use of Microcomputers in Instruction

John Winkler, et al., 1986
Rand Corporation, P.O. Box 2138, Santa Monica, CA, 90406-2138, $7.50

This 67-page booklet describes policy mechanisms to encourage greater use of microcomputers as an instructional tool in subject matter courses. Based on responses from 155 computer coordinators to a nationwide survey about administrative policies on microcomputer use, the report analyzes the value of (1) offering incentives, (2) providing technical support, and (3) involving staff in decision making.

Computer Applications Planning

Merrimack Education Center, January 1984
101 Mill Creek Road, Chelmsford, MA 01924, 617/256-3985, $10.00

This 90-page planning guidebook identifies and describes essential planning activities in a curriculum driven process. It is organized into five major steps: planning for change, integrating computers, staff development, hardware and software acquisition, and organization and implementation. It contains many usable examples and checklists. Five states have adopted it for statewide distribution.

Computer Decisions for Board Members: Getting the Most from What Your District Selects

Stanley Pogrow, 1985
Teach'Em, Inc., 160 East Illinois Street, Chicago, IL 60611, $18.95

A very practical planning book that includes planning for instructional and administrative uses. Planning for instructional use of computers is divided into elementary and secondary levels and follows an approach termed "Targeted Improvement Planning" (TIP). TIP defines elements that should structure decisions. The book is filled with useful tables and figures including implementation timelines, numerous sample budgets, and phase-in schedules.

The Cupertino Concept: Computer Literacy

Cupertino Union School District
10301 Vista Drive, Cupertino, CA 95014, 408/252-3000, $50.00
(Project information packet—free)

Describes a comprehensive program for preparing schools to infuse technology into the curriculum. Includes three areas of training: long- and short-range planning (philosophy, goals, policies, implementation plan); staff development (course design, internal resources, incentives, teacher network); and computer literacy curriculum (scope and sequence, lesson plans, student activity pages, integration of software ideas). Also includes guidelines for hardware and software selection, a staff development program, curriculum and instructional materials development, and equity guidelines. (Project also provides two-day onsite training.)

The Elements of Computer Education

Montana Office of Public Instruction, 1983
Division of Public Information
State Capitol, Helena, MT 59620, $7.50

A friendly, how-to-start-a-computer-program guidebook. Includes: needs identification, goal setting, survey questions, hardware and software selection, computers in the curriculum, administrative uses, staff development, and a directory of resources.

High Tech for Schools: Problems and Solutions

American Association of School Administrators, 1984
1801 North Moore Street, Arlington, VA 22209
12.95 + $2.50 Handling

This comprehensive report draws from many leading authorities and print sources. The chapter on instructional uses lists models of computer use and district case studies. The planning chapter describes planning recommendations in three different states and outlines a six-step planning process. The hardware chapter describes a decision-making process for purchasing and includes tips on budgeting and funding. The staff development chapter describes programs in several districts. The software chapter includes a selection process and policy statements. Three additional chapters on administrative uses, special education, and other technologies include guidelines and resources.

High Tech Schools: The Principal's Perspective

National Association of Secondary School Principals, 1984
1904 Association Drive, Reston, VA 22091

Composed by various experts in technology, as well as 46 secondary school principals, this guide examines future educational trends in an information society. Excellent for the administrator interested in an overall view of technology in education and in the job market of the future. Discusses the changing roles of school administrators, as well as evidence that high tech is here to stay. Recommendations focus on: educational planning, school curriculum, professional development, finances, and the formation of school improvement partnerships. Includes ideas on how principals can assist in implementing recommendations. Of particular interest, a chart listing educational goals, delivery systems, personnel, financing, and community outreach as they fit into an industrial society (present) and an information society (future). Also described are four stages of development for full implementation of computers for instruction.

Long Range Planning for Computer Use
David Moursund and Dick Ricketts, 1987
Information Age Education, 1250 E. 29th Place, Eugene, OR 97403–1621, $35.00

This thoughtful approach to planning always maintains its focus on education for an information age. An initial careful discussion of problem solving sets the stage for the author's strategic planning process. Nineteen issues and special topics of concern are discussed, including: computer-integrated instruction, home computers, hiring computer educators, life expectancy of hardware and software, artificial intelligence, and acquisition and storage of software. (Price includes a copy of the book in MacWrite format on an 800K disk.)

Long Range Technology Planning
Sueann Ambron, editor, Winter 1986
Learning Tomorrow, Apple Education Advisory Council, Apple Computer, 20525 Mariani Avenue, Cupertino, CA 95014, 408/996-1010

This is the second issue of a quarterly series that shares the results of Education Advisory Council meetings at Apple Computer. Includes brief highlights of a meeting on long-range planning and actual long-range technology plans for three states, one county, two districts, and one school.

Manual for Writing a Microcomputer Implementation Plan
Houston Independent School District, Department of Technology
5300 San Felipe, Houston, TX 77056, 713/960-8888, $25.00

This handbook helps users plan school-wide use for microcomputers. It is organized in two sections—the first concerns planning and completion of the brief planning document, and the second discusses preparing for delivery, installation and maintenance of equipment. Software information is included in the Appendix. (Publisher's description.)

Microcomputers in Education: An Introduction
Adeline Naiman, January 1982
Northeast Regional Exchange, 34 Littleton Road,
Chelmsford, MA 01924, $6.00

This older but still useful planning guide includes: a rationale for planning, funding strategies, an overview of state policies on microcomputer acquisition, computer uses in education, software and hardware purchasing, teacher education, and program assessment. The Appendix includes an eight-step hardware purchasing model, lists of periodicals, and sample software evaluation forms.

Planning for Educational Technology

Minnesota Educational Computing Corporation
Distribution Center, 3490 Lexington Avenue North,
St. Paul, MN 55126, 612/481-3500, $9.00

Designed to support development of long-range plans for the use of technology in education. Components include conducting a technology status check, developing a statement of philosophy, setting goals (with extensive examples), implementing the plan (personnel, purchasing, training, budgeting, and timelines), evaluating the progress of the program, and two sample plans.

Technology Utilization Plan

Technology Education Center, February 1984
Hopkins Public Schools, 1001 State Highway #7,
Hopkins, MN 55343, 612-933-9320, free

This is a technology plan from a suburban Minneapolis district. It includes: assessment results, philosophy statement, goals for instructional and management uses of technology, implementation plan with proposed activities and teacher inservice, community education, evaluation and reporting, and review. This district also disseminates two microcomputer-based testing programs. Part of project rated exemplary by U.S. Department of Education National Diffusion Network.

Planning Articles

"A Comprehensive Master Plan for Computer Utilization in Public School Districts."
Fredric Splittberger, et al., *Educational Technology*, July 1984, v.24, n.7, p.17.

Presents the case for a centralized computer use plan, addressing both administrative and instructional needs. Focus is on the kind of data generated and information needed in five categories: staff personnel, finance/accounting, pupil personnel, classroom/instruction, and administrative support services. Includes five tables that subdivide kinds of information needed in each category.

"Computers in the Schools: 21 Critical Issues for Policy Decisions."
Leah Rampy, et al., *Educational Technology*, August 1983, v.23, n.8, p.20.

Identifies and discusses 21 policy issues related to computers in education in five areas of concern: curriculum, courseware, teachers' needs, other constituents' roles, and acquisitions and funding.

"Developing a District-Wide Computer Use Plan."
Glenn Fisher, *The Computing Teacher*, November 1983, v.11, n.1, p.52.

Describes a K-12 framework for computer use at a school district with enrollment of 2200 students. The framework includes: goals (by grade level), approach, hardware needs, staff development, personnel, facility, and prerequisites. The article also gives a budget plan and the computer planning committee report.

"Developing an Effective Plan for Instructional Computing."
James Steber, *THE Journal*, April 1983, v.10, n.6, p.110.

A brief overview of planning considerations. Proposes a systematic, five-phase approach to planning. Lists eight guidelines for planning.

"A Five-step Process to Help Educators Decide How to Use Computers in Schools."
Janet Parker, *NASSP Bulletin*, April 1985, v.69, n.480, p.2.

Focuses on five planning areas: (1) planning committee tasks, (2) determining program goals, (3) specifying computer objectives in a curriculum, (4) implementing the computer program with staff training and hardware/software purchase, and (5) evaluating the program.

"A 4-Stage Model of Development for Full Implementation of Computers in a School System."
Sheila Cory, *The Computing Teacher*, January 1983, v.10, n.5, p.11.

Describes four stages of growth in developing a fully-implemented computer education program: (1) Getting on the Bandwagon, (2) Stage of Confusion, (3) Stage of Pulling it All Together, and (4) Stage of Full Implementation. A good article for balancing expectations and realities in developing a program.

"A Four Year Plan for Implementing Computers into Public Schools: Part 1."
Morris McClellan, *SIG Bulletin*, January 1984, v.1, n.2, p.8.

Covers the first-year goals of an implementation plan and includes suggestions for formation of a computer committee and a cadre of trained experts, establishing a philosophy, example goals, staff training, hardware and software policies, and setting goals for the next three years.

"Long-Range Planning for Computer Use."
M. Tim Grady, *Educational Leadership*, May 1983, v.40, n.6, p.6.

Provides planning guidelines that emphasize instructional goals and priorities. Includes several charts with examples: three-year priority list, hardware needs, staff development, cost summary and amortization, and program revision plan.

"Planning for Educational Computing."
Jim Poirot and Merridee Heidt, *Electronic Learning*, September 1982, v.2, n.1, p.34.

The major focus is a three-part questionnaire for educators; it is useful for surveying attitudes, needs and interests in educational computing. Describes how responses can be interpreted to assist with planning decisions.

"Planning for Technology: The Key to Successful Implementation."
Janet Witthuhn, *Educational Technology*, August 1985, v.25, n.8, p.27.

Describes how a large urban school district relates technology planning to its ongoing strategic planning process. Out of 121 action items in a five-year plan, 22 were technology action items. Describes formation and tasks of the Technology Coordinating Council. Includes brief discussions of budget priorities and budget options.

"The School District Role in Introducing Microcomputers: A Contingency Planning Approach."
Richard Williams, et al., *Educational Technology*, December 1984, v.24, n.12, p.37.

Discusses pros and cons of decentralized vs. grassroots approach to introducing computers. Presents complications of the "no-plan" approach and a linear planning process and then suggests an intermediate scheme for planning—Contingency Planning. This style of planning includes preparation for unanticipated events or conditions. Presents four steps in this approach and a detailed table of issues in need of district attention.

"State of the Art: Microcomputers in Elementary Education 1984."
Ray Topp, *The Computing Teacher*, February 1985, v.12, n.6, p.34.

Contains results of the author's observations of microcomputer use in several school districts in four different countries. Summarizes observations and presents recommendations on hardware, software, uses in K-6 classrooms, and teacher training.

"10 Essential Truths to Help You Plan for Technology Use."
Charles Majkowski, *Tech Trends*, October 1985, v.30, n.7, p.18.

Presents 10 basic observations and understandings about computer technology in education. Discusses implications for educators, particularly administrators in leadership roles.

"Technology: Implications for Long-Range Planning."
David Foster, *Educational Technology*, April 1988, v.28 n.4, p.7.

Following careful discussion of the need for long-range planning, presents state-level, systems-based planning recommendations that have an eye on the future and the impact of technology.

ERIC Documents on Planning*

"Computer Education: A System-Wide Approach."
Marilyn Gardner, Boston Public Schools, Conference Paper,
American Vocational Association, December 1983, ED 253 202.

Outlines the organization and development of a system-wide expansion of computer technology. Topics include: present status of program, development of a position paper, forming a computer policy committee, priority activities, funding, curriculum, software acquisition, staff development, maintenance and security, dissemination of information, status reports, and future policy. Also includes many appendices containing samples from Boston Public Schools.

"Wisconsin Guidelines for Instructional Computer Use in Education, K-12."
Wisconsin Department of Public Instruction, January 1985, ED 275 305.

Provides guidelines for planning, implementing and evaluating a computer program at the local level. Also includes a chapter of general material about computers in education. Specific topics include: staff development, hardware and software selection, copyright issues, curriculum development with a scope and sequence chart, and assessment of the program. This document has been revised and will eventually be available through ERIC.

"Computer Literacy: Definition and Survey Items for Assessment in Schools."
Marlaine Lockheed, et al., National Center for Educational Statistics,
September 1983, ED 238 895.

This report is a large pool of survey questions useful for planning and assessing a technology program. There are three types of survey items: Questions on respondents' computer-related background, validation items, and inventory items for computer-related resources.

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* ERIC Documents are available from: Eric Document Reproduction Service (EDRS), 3900 Wheeler Avenue, Alexandria, VA 22304. When requesting information on reproduction and shipping costs, use ED Number.

Program Evaluation

"Computer Evaluation Cometh"
Dan Watt, *Popular Computing*, July 1984, v.3, n.9, p.91.

Raises the issue of accountability: What exactly is the computer doing to the teaching and learning process? Points out a dilemma in evaluating computer education—how to create tests that are useful in two or three years. For some, computer education is too young; a process of monitoring a program is more appropriate than evaluating it.

Computer Literacy Tests for Grades 4, 7, 11
Northwest Regional Educational Laboratory, Office of Marketing
101 S.W. Main, Suite 500, Portland, OR 97204, 503/275-9515,
$39.95 for 35 test booklets and examiner's manual

Each test includes 40 or 50 multiple-choice items designed to assess the student's knowledge and skills about computers. Test items are based on curriculum objectives representing expert opinion on the meaning of computer literacy. Field tested with more than 3000 students.

Computer Science Test for Grades 9-12
same contact as above

Test consists of 50 multiple-choice items. Recommended for students who have had the equivalent of at least one semester course in computer science. Field-tested with more than 1000 students.

District Survey Report on Computing Activities in Oakland County Public Schools
IICD-Oakland Schools, September 1985
2100 Pontiac Lake Road, Pontiac, MI 48054, 313/858-1895, $5.00

A useful example for technology program assessment and reporting; summarizing the results of a survey of 25 districts on current computing activities, needs, and future plans. Topics include: computing, coordinating, hardware, quantity and distribution, software, curriculum and computer use, staff inservice, summary and conclusions.

An Evaluation Handbook for a Computer Education Program
Karen Billings, 1986
International Council for Computers in Education,
University of Oregon, 1787 Agate Street,
Eugene, OR 97403, $14.00

A very thorough handbook for evaluating a computer education program. Major sections include planning the evaluation, and gathering and using information from the evaluation. Provides numerous reproducible samples, forms and checklists.

Communication and Outreach

Computers Can

Houston Independent School District, Department of Technology,
5300 San Felipe, Houston, TX 77056, 713/960-8888
Descriptive Booklet, $5.00
Sample Booklet (Spanish/English), $7.50
Training Manual, $50.00

Computers Can is a successful program designed to help parents assume an active role in improving their children's study skills. Parents and students receive twelve hours of computer training after school. Parents may then check out hardware and software for use at home. The sample booklet illustrates the program including speak-and-spell exercises, keyboard charts, and helpful hints for making the most of the computer. Text is given in Spanish and English on separate pages. The training manual for presenters of workshops for novice computer users is designed for use with the Texas Instruments Model 99/4A home computer, but is applicable for schools using other computers in similar programs. Used for the first parent computer checkout training program of its kind in the nation, this manual is a valuable resource for schools. (From publisher's description.)

Gaining Community Support - Planning a Computer Awareness Day

Computer Directions for Schools, 1983
P.O. Box 1136, Livermore, CA 94550, $7.95 + $2.00 Handling

A manual for how to organize a computer awareness day for creating beneficial contacts with community, business and industry. The ideas have been used successfully at K-6 levels. Includes: preliminaries, planning, topics for the event, organization strategies, evaluation and follow-up computer shows. Appendix includes examples: letters, invitations to present and participate, follow-up responses, evaluation forms and announcements.

How to Plan a Back-to-To-School Event for your Community"

Karen Billings, *Classroom Computer Learning*, October 1987, V.8, n.2, p.57.

Provides a set of guidelines for planning an open-house event that will increase community awareness for a school's technology program.

Organizing a Computer Club for Elementary School Children

Computer Directions for Schools, 1983
P.O. Box 1136, Livermore, CA 94550, $7.95 + $2.00 Handling

A manual for providing a K-6 after-school computer club utilizing parents and other volunteers. Topics include: gaining support for the club; volunteer training sessions; procedures for club sign-up, and evaluation. Appendix includes examples: invitations to volunteers, thank yous, attendance roster, sign-in sheets, volunteer schedule, reminder note, evaluation questionnaires.

Parents, Kids, and Computers
Lynn Alper and Meg Holmberg, 1984
Sybex Computer Books, 2344 Sixth Street, Berkeley, CA 94710,
415/848-8233, $4.95

A book by parents and teachers for parents. Shows parents how children can use home computers as learning tools. In addition to explaining several general uses, it answers questions and responds to anxieties parents may have.

"Student Motivation: A Lesson from Computer Clubs."
Dick Fransham, *Educational Technology*, December 1985,
v.25, n.2, p.22.

Author's account of three computer clubs—two in secondary schools (one in an upper-middle class area, the other in an inner city) and one in an elementary school. All three met with mixed success—partly because of students' background and partly because of the advisor's changing role. The author concludes clubs are most successful when the members are self-directed, and the advisor recognizes that computers do not automatically motivate students.

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2. CURRICULUM DEVELOPMENT

OVERVIEW

A carefully planned computer curriculum forms the basis for planning other components of the technology program: staff development, software and hardware acquisition, and facilities. This chapter discusses curriculum concerns and outlines steps in the curriculum development process.

Curriculum Considerations

Impact of Technology. In general, the use of technology has the potential to impact classroom practices in three ways. First, technology can expand and enhance what is already being taught. A good example is the change in writing instruction with the use of word processors. Teachers report that students using word processors are composing more material with greater concern for revision and improvement of their written work. Second, with sufficient hardware access, technology will alter existing methodologies and teacher roles. Classrooms tend to become more student-directed with teachers serving as facilitators and coordinators of several simultaneous activities. Third, technology will add new practices that have not been possible in the past. An example might be the use of telecommunications where students in separate locations can interact and share in an activity or exploration.

Computer Curriculum Areas.

- Computer Literacy/Awareness—Many districts have added a new course usually at the middle school level to introduce students to microcomputers and the issues of a technology-based world. There is a lack of consensus about what computer literacy means and whether or not it should be taught as a separate strand. Many districts infuse computer literacy content into regular curriculum, believing that the use of computers in all subjects and grades will impart the necessary literacy. Other districts maintain a separate computer course for all students, believing that certain topics such as programming or computer ethics belong in a stand-alone course.
- Computer Integration—Many districts with established technology programs are focusing on computer use in all subject and grade level classrooms. The microcomputer is used whenever it enhances the classroom activities and furthers the classroom objectives and goals. Computer applications like word processing and database management are used along with software designed for the subject area and grade level.
- Computer Science—Beyond the introductory awareness and literacy courses, districts may provide advanced programming and computer science courses.
- Business Applications and Data Processing—Business education programs offer courses on business applications of microcomputers. These courses provide students with marketable, computer-related skills.

Staff and Program Readiness. Changes in curriculum should be phased-in according to the readiness of the teaching staff and the availability of software and hardware. It is not appropriate to implement an advanced placement computer science program until there is staff sufficiently prepared to handle such a course. Full-scale integration of computers is also not feasible until the software and hardware are present. Implementation timelines must reflect the staff development plans as well as the software and hardware acquisition plans.

Equity. Full consideration must be given to assure the curriculum supports and encourages all students to use technology. The potential value of computer learning must be imparted to females, minorities, and the disabled. Opportunities for using technology in classrooms or after school should be available to all students.

Keyboarding. In spite of promising new developments in alternative methods for input, the keyboard remains the primary input option. For effective experiences with many computer applications, students need some keyboard proficiency. Many districts have implemented formal instruction in keyboarding in the intermediate grades.

Curriculum Development Process

1. Establish a technology curriculum development committee

Curriculum development occurs at several levels and should involve different groupings of staff. At the broadest level, a curriculum framework containing goals, scope, and sequence for the district technology program should be developed. It will serve as a guide for the curriculum development that occurs at subject area, course, or program levels. Membership of the district-wide technology curriculum committee will fluctuate with time to incorporate smaller task groups working on curricula for special areas. Ideally, all personnel involved in curriculum development are familiar, if not experienced, with the variety of instructional applications of computers.

2. Review the district philosophy and broad goals

All curriculum development is defined by the philosophy and goals laid out in the general technology plan. It is important that all personnel involved in curriculum development are aware of them.

3. Refine and organize broad goals of the technology plan

The broad goal statements need to be translated into several more specific instructional goals and organized into categories, topic areas, or strands. Goals for specific subject areas, courses, and programs will eventually be defined.

4. Decide on approach to computer literacy and computer awareness

Computer literacy and computer awareness can be handled as a separate course, infused into existing curriculum, or a combination of both. Districts with a combination of the two approaches offer a separate course for secondary level students that is gradually phased out as elementary students become "computer literate" through integration.

5. Review existing curriculum documents for matching the use of technology to the curriculum

Ongoing review and revision of the existing curriculum will match uses of technology by enhancing, replacing, or adding goals and objectives that incorporate the use of technology. As curriculum development progresses to the level of specific courses and subjects, this matching process will mean correlating software to the curriculum as lessons and activities are developed.

6. Specify learning objectives

Goal statements are further refined with specific learning objectives. Some develop district-wide competency statements prior to specifying the objectives.

7. Develop lessons, activities, and materials

The development of lessons and activities is done by staff with sufficient experience and training. Detailed lesson and materials development depends on staff readiness and often is a component of the staff training program. Fortunately, detailed curriculum development can begin with existing materials and strategies. There are several excellent activity-oriented resources to draw from.

8. Disseminate, review and revise curriculum materials

All products that result from curriculum development must be used and revised regularly.

CHECKLIST

Curriculum Considerations

Notes

__________ 1. Impact of Technology
- Enhance or replace current practices
- Alter methodologies and teacher roles
- Add new practices

__________ 2. Computer Curriculum Areas
- Computer literacy/computer awareness
- Computer integration
- Computer science
- Business applications

__________ 3. Staff and Program Readiness
- Staff development plan
- Software and hardware availability

__________ 4. Equity
- Females
- Minorities
- Low income
- Disabled

__________ 5. Keyboarding
- Formal instruction

Curriculum Development Process

__________ 1. Establish a curriculum committee
- Membership depends on curriculum development level
  - district-wide curriculum framework
  - subject area, grade or program level

Curriculum Development Process (cont.)

Notes

- Members have instructional computing experience/exposure
- Members receive ongoing training

__________ 2. Review philosophy and broad goals

- Committee understands philosophy and goals

__________ 3. Refine and organize broad goals

- Write specific instructional goals
- Organize goals by category, topic or strand

__________ 4. Choose district approach to computer literacy/awareness

- Separate course
- Infused into existing curriculum
- Combination

__________ 5 . Review existing curriculum documents

- Match use of technology with existing curriculum
  - enhance goals and objectives
  - add goals and objectives
  - replace goals and objectives
- Correlate applications and software to curriculum

__________ 6. Specify learning objectives

- Develop district competencies
- Write objectives

__________ 7. Develop lessons, activities, and materials

- Design lessons and activities
- Prepare materials

__________ 8. Disseminate and review materials

- Materials made available to appropriate staff
- Materials used, reviewed, and revised

RESOURCES

K-12 Computer Curriculum Planning

Guides and Texts

Computer Education: Scope and Sequence (Grades K-12)
Anchorage Borough School District, Anchorage, AK, 1985
ED 264 829 (See page 13, Chapter 1 for ordering ERIC documents.)

Describes a school district's scope and sequence for computer use. Included is a curriculum scope chart for each grade K-6 and program sequence for K-12. Program and instructional objectives cover science, social studies, mathematics, and language arts. Charts include a correlation of objectives with recommended texts, curriculum units, suggested software, and other resources. Describes eight individual courses that teach about computers or teach a programming language.

Computers and Information Technology
Willard Daggett, et al., 1985
South-Western Publishing Co., 5101 Madison Road,
Cincinnati, OH 45227

A classroom textbook designed to be an introduction to information technology and applications in grades 7-9. Main focus is business applications. The book is divided into four parts: Information: Nature and Need; Processing Data and Developing Information; Information Systems and Programs; and Looking Ahead. Color pictures, diagrams, vocabulary lists, questions, summaries, and a glossary help make this a readable text. Meets Level 1 content recommendations of *The DMPA Secondary Curriculum on Information Technology and Computer Information Systems.*

Computers in Education: Goals and Content
California State Department of Education, 1985
Bureau of Publications, 721 Capitol Mall,
Sacramento, CA 95814-4785, $2.50

A model computer education course of study for grades 1-12 approved by the California State Board of Education. This was prepared by the California Department of Education at the request of the state legislature. Stresses the use of word processing, spreadsheets, database managers, problem solving, and programming languages. Would be of use to any school or district developing a computer curriculum.

Curricula Recommendations for Secondary Schools and Teacher Certification
Association for Computing Machinery, 1985
P.O. Box 64145, Baltimore, MD 21264, $19.00

Recommendations from a task force of secondary and university teachers, computer specialists, and computer science education specialists. Presents two curricula: secondary computer science and a teacher certification curriculum in computer science. The secondary curriculum description includes goals, objectives, and topics. The certification curriculum provides proposed curriculum, programming languages, and curriculum validity. This would be useful to a school or school district interested in implementing a computer science curriculum or teachers and planners preparing for computer science certification. (Also appears in *SIG Bulletin*, July/August/September 1985, v.2, n.1, p. 21.)

The DMPA Secondary Curriculum on Information Technology and Computer Information Systems
Data Processing Management Association, October 1984
Educational Services, 505 Busse Highway,
Park Ridge, IL 60068-3191, 312/825-8124, free

A computer curriculum guide which focuses on business applications including business management, business administration, and information systems. This booklet describes four courses: computer literacy (grades 7-9), a "career-related introduction to computers and their applications" (grades 8-10), an honors course (grades 11-12), and practical training (grades 11-12). Objectives, description, and content outlines are included.

Emerging Technologies: Resources for Teaching Technological Literacy
C/VEG Publications, 1983
Santa Clara County of Education,
100 Skyport Drive, Mail Code 236, San Jose, CA 95115, $12.50

Focuses on six of the "hottest" new technology fields: laser, telecommunications, robotics, medical technology, bioengineering, and CAD/CAM. Each includes a description and history, curriculum, sample teaching units, pre-test, glossary and bibliography, and possible careers. (Sequel to *The Future is Now.*)

The Future is Now: A Module for Teaching Technological Literacy
C/VEG Publications, 1983
Santa Clara County of Education,
100 Skyport Drive, Mail Code 236, San Jose, CA 95115, $10.00

Focuses on technological literacy and the effect of technology on our future. Organized in three parts: Part I: technological literacy, impact of technology on education, introduction to bioengineering; Part II: sample teaching units; and Part III: high-tech glossary, and film resources.

Guidelines for Computer Curricula
Houston Independent School District, Department of Technology
5300 San Felipe, Houston, TX 77056, 713/960-8888, $20.00

Resource from a school district's team of technology specialists covering all related areas from staff training to curriculum development and courseware design. For use by schools who have inadequate technology planning and coordination or are planning an implementation program. (From publisher's description.)

Information Technology Scope and Sequence

Portland Public Schools, 1984
Portland Public Schools Curriculum Department, 501 North Dixon
Portland, OR 97227, free to school districts

A scope and sequence designed for grades K-12. Includes four basic strands: operations, applications, programming and problem solving, and implications. This scope and sequence is independent of any computer language, leaving that choice to individual teachers.

K-12 Computer Education Curriculum Guidelines

Office of the Superintendent of Public Instruction, 1986
Old Capitol Building, FG-11, Olympia, WA 98504, free

A computer curriculum planning guide that provides a complete K-12 set of student outcomes, teacher implications, and resources (books and software) listed in four general topic areas of computer education: fundamental skills, applications, ethical and social issues and advanced skills. Concludes with four example units that integrate computers into the classroom.

Minimal Computing Competencies and the Curriculum

Oakland County Computing Coordinators Committee, October 1984
IICD-Oakland Schools, 2100 Pontiac Lake Road,
Pontiac, MI 48054, 313/858-2037, free

A brief paper addressing district planning and the role of computing in the curriculum. Includes philosophy; and four goals with skills, including computer operation and software use, computer interaction, the computer as a problem-solving tool, and societal impact.

Technology Programs That Work

U.S. Department of Education
Office of Assistant Secretary for Educational Research and
Development, Washington, DC 20208, $3.50

Contains descriptions of the U.S. Department of Education's National Diffusion Network (NDN) programs which are considered to make effective use of technology. Lists 44 programs including lighthouse projects; NDN-funded Developer Demonstrator Projects; and unfunded, validated projects. Includes general descriptions, information on technology, resources, services provided, and contact persons. Geographical, alphabetical, and ERIC Descriptor indexes are included. Each project site can be contacted for information and resources.

Articles

"A Computer Education Program Benefiting from Curriculum Planning."
Robert Otto, *Educational Research Quarterly*, 1985-86, v.10, n.1, p.17.

Proposes six questions a district may ask about a particular curriculum area, then answers how they relate to computer technology curriculum. Discusses what students should learn (includes software choices); timeline for implementing program, including teacher training; and factors to consider when evaluating students. This article is one of seven published in a special edition of *Educational Research Quarterly*, focusing on computers in education. (Available from: University of Southern California, School of Education, Phillips Hall, University Park, Los Angeles, CA 90089-0031, $5.50.)

"Computers, Curriculum, and Careful Planning."
Dorothy Jo Stevens, *Educational Technology*, November 1981, v.21, n.11, p.21.

Discusses the major uses for instruction: computer science, computer literacy, computer-assisted instruction, and computer-managed instruction while describing teaching strategies. Especially helpful are the practical suggestions to maximize computer use.

"Computers in Education Program Development at the District and Elementary School Level."
Jack Turner, *SIG Bulletin*, 1984, v.1, n.4, p.30.

Identifies and comments on several key issues pertinent to public schools' future. Will schools successfully incorporate computer use or, if not, become obsolete by the computer? Describes various solutions including grassroots interest, computer programming as the keystone to literacy, integrating computers into the curriculum, and a proposed plan for computer use.

"A Four-Year Plan for Implementing Computers into Public Schools—Part II."
Morris McClellan, *SIG Bulletin*, 1984, v.1, n.2, p.17.

Part II focuses on development of K-12 curriculum addressing problems in designing curriculum: resistance to change and lack of consensus on what is important in computer education. Presents three different models for computer literacy and a set of four criteria for computer curriculum decisions.

"The Road to Computer Literacy: A Scope and Sequence Model."
Gary Bitter, *Electronic Learning*, 1982-83, v.2, n.1-5.

Five-part series describing a scope and sequence for K-12 computer literacy. Author interprets "computer literacy" which he divides into awareness and programming. A chart of those areas, grade level, and topic is included in Part I (September). Part II (October) deals with objectives and activities for grades K-3; Part III (November/December), grades 4-6; Part IV (January), grades 7-9; and Part V (February), grades 10-12. All parts include up to seven topics, each with objectives, content area, and specific learning activities.

Computer Literacy/Computer Awareness

Handbooks and Manuals

CLAS: Computer Literacy and Awareness for Students
Tri-County Computer Consortium, September 1984
IICD-Oakland Schools, 2100 Pontiac Lake Road, Pontiac, MI 48054,
313/858-2121, $7.00

A 278-page resource book of classroom activities for grades 1-8. Includes nine units of study from computer familiarity to BASIC programming. Goals and activities are outlined along with dozens of activities for all grade levels at and away from the computer. Most activities include reproducible worksheets. An excellent resource for activity ideas.

Com-Lit: Computer Literacy for Kids
Carin Horn and Carroll Collins, 1984
D.C. Heath and Co., 125 Spring Street, Lexington, MA 02173,
617/862-6650, $18.00

A 421-page spiral-bound textbook designed for K-6 students. May be used as a four-week or a full semester's course. Individualized to accommodate student's various levels of "computer literacy," and introduces BASIC and Logo.

"Computer Awareness Activities and Computer Curriculum K-5."
Judith Meyers, Lakewood City School District, OH, 1984
ED 254 197. (See page 13, Chapter 1 for ordering ERIC documents.)

The first of the two documents provides a list of 105 computer awareness activities for classroom use. Most activities are described in their simplest form, and may be adapted for older students. The second document presents a 12-lesson computer awareness curriculum for elementary students. Instructional materials include worksheets, quizzes, transparencies, and flashcards on vocabulary, hardware, and software.

Computer Literacy
NAVA, the International Communications Industries Association,
3150 Spring Street, Fairfax, VA 22031, 703/273-7200, free

A brochure containing a short quiz to assess knowledge of computer hardware, software, and applications. Quiz uses matching, true/false, and short answer format. Includes a list of resources for additional information.

Computer Literacy: A Hands-On Approach
Arthur Luehrmann and Herbert Peckham, 1983
McGraw-Hill Book Company, 8171 Redwood Highway, Novato, CA 94947,
415/897-5285, $17.97

A first computer course which shows students how to operate a computer, load and run programs, and write and debug simple programs in BASIC; it also discusses historical, social and ethical computer issues. Most likely for middle school grades, this 370-page textbook includes 66 units with a lab manual built in. Each unit, about 45 minutes in length, alternates between teacher-directed discussion and hands-on lab units without teacher supervision. Designed to use with the Apple II or TRS-80. Other components, for an additional cost, include a teacher's resource guide ($14.01), student workbook ($5.01), and diskette ($9.96). The teacher's guide includes activity plans using from 1 to 30 classroom computers, lab floor plans, and teaching tactics along with supplemental activities and teaching ideas in conjunction with the text.

Computer Literacy: Curriculum Guide

Texas Education Agency, February 1985
Publications Distribution Office, 201 East 11th Street,
Austin, TX, $4.00

This 160-page curriculum guide contains objectives, activities, and resources for a computer literacy course. Developed for the Texas State Board of Education as a guide for educators of seventh or eighth grade students teaching the state-required one semester computer literacy class. Easily adapted to elementary classes, and with some modification, to high school students. Guide includes an extensive list of creative student activities: many to be completed away from the computer, some of which get students out in the community. Other topics include programming, computer clubs, keyboarding, sample resources, and teacher-made materials (board games, egg carton computers, and binary card games, for example).

Computer Literacy Modules

Houston Independent School District, Department of Technology
5300 San Felipe, Houston, TX 77056, 713/960-8888

High School: Computer Concepts

Teacher's Manual	$25.00
Programming	$10.00
Computer-Assisted Instruction	$15.00
Word Processing	$15.00
Research	$15.00
Hand-Held	$15.00
Databases/Spreadsheets	$15.00
Whole Classes	$15.00

High School: Computer Applications

Teacher's Manual	$25.00
Programming	$15.00
Computer-Assisted Instruction	$15.00
Database	$15.00
Word Processing	$15.00
DOS	$15.00
Research	$15.00
Spreadsheets	$15.00
Whole Class	$15.00

Materials developed for computer-literacy instruction which follow a modular self-study approach in which the teacher acts as manager of instruction. The teacher's manual gives guidelines for reorganizing the classroom, typical classroom routines, additional resources, and explains how the self-study modules are organized. (From publisher's description.)

Computer Literacy: Problem-Solving with Computers

Carin Horn and James Poirot, 1985 (Second Edition)
D.C. Heath and Co., 125 Spring Street, Lexington, MA 02173,
617/862-6650, $21.95

A 304-page textbook emphasizing a general understanding of computers (history, functions, and applications). Each chapter includes student activities, suggested quiz questions, discussion topics, glossary, and bibliography. Introduces BASIC and Logo.

Computer Literacy Project: Computer Awareness Elementary School

Educational Development Center Publications, December 1984
Santa Clara County Office of Education,
100 Skyport Drive, Mail Code 236, San Jose, CA 95115,
408/947-6534, $30.00

A three-ring binder filled with primary and intermediate level activities for students, K-8. Includes computer history, parts, and uses; teacher preparation and activities; glossary, bibliography, transparency masters, worksheets, and handouts. Most of the activities do not use the computer. Developed for classroom and computer education teachers as an entire course or as stand-alone activities.

Computers in the Curriculum: A Computer Literacy Guide, Grades K-6

Minnesota Educational Computing Corporation, October 1984
3490 Lexington Ave. North, St. Paul, MN 55112, $79.00

An intensive plan for integrating computer use into K-6 curriculum. Designed to be used on the Apple IIe. There are four handbooks: K-1, 2-3, 4-5, and 6. Each includes goals and objectives, fifteen lessons for each grade level, as well as an overview, software lists, reproducible activity sheets, and classroom materials. Uses various producers' software, but the majority is MECC's. Includes reproducible worksheets, courseware review form, and glossary with each grade introduced.

Course Goals for K-12 Computer Education

Tri-County Goal Development Project, 1985
CEDS, P.O. Box 4791, Portland, OR 97208, $31.60

A collection of 1001 goal statements for computer literacy curriculum. Organized as system, program, course, and instructional goals with behavioral and performance objectives.

Introduction to Computer Applications: A Hands-on Approach

Arthur Leuhrman and Herbert Peckham, 1986
McGraw-Hill Book Company, Webster Division,
1221 Avenue of the Americas, New York, NY 10020,
800/223-4180

Student Booklet	$ 8.52
Teacher's Guide	15.00
Data Diskette	9.96

This package of materials teaches word processing, spreadsheet, and database management using the popular Appleworks program. The textbook presents well-sequenced lessons, guiding student work at the computer and providing reading and discussion material. The teacher's guide provides general classroom management tips as well as guidelines for each session.

MacMillan Computer Literacy

Peter Dublin and Peter Kelman, 1986
MacMillan Publishing Company, 866 third Avenue,
New York, NY 10022

Student Text (hardback)	$ 19.95
Teacher's Manual	26.94
Workbook—Student Version	3.60
Workbook—Teacher's Edition	4.50
Teacher's Resource—Blackline Masters	41.64
MacMillan Works—Student Version	20.00
MacMillan Works—Full Version	96.40

This is a complete materials package for a middle-school-level computer literacy course. It includes a 432-page student text, a spiral-bound teacher's edition, and an integrated software package. MacMillan Works is available for Apple, Commodore, IBM and TRS-80, and includes word processing, database management, and spreadsheet analysis. There is also a workbook to accompany each version of MacMillan Works. The textbook divides 79 lessons into the following five units: Computers Yesterday and Today, The Computer System, Using Software Tools, Computer Programming, Computers and Society. There is a problem-solving and computer careers strand.

My Students Use Computers: Computer Literacy in K-8 Curriculum

Beverly Hunter, 1984
Reston Publishing Co., Reston, VA, $22.95

A 375-page book designed for anyone interested in classroom computers from school board member to teacher to parent. Information includes an overview of the curriculum; objectives, scope and sequence, and activities for grades K-8; implementation guide; and appendix and resources. Since 200 people contributed ideas and information contained in this book, it is a wealth of information for implementing a computer usage plan.

Robots—A Teacher's Guide to Resources and Activities

Buhl Science Center, Allegheny Square,
Pittsburgh, PA 15212, $5.00 + $2.20 Handling

A collection of activities allowing a teacher to create a unit on robots without having one in the classroom. Lessons include a simulation using robot language and designing a robot. Originally aimed at elementary and middle school classes, this could be adapted for the high school level. Also included are a glossary of computer terms, reading list for students, resources for teachers, and a list of manufacturers and distributors.

Teaching Computer Literacy: Lesson Plans and Activities for Your Classroom (K-4), (5-8)

Gary Bitter and Donna Craighead, 1984
D.C. Heath and Co., 125 Spring Street, Lexington, MA 02173,
617/862-6650, $33.00 each

Designed for educators who are teaching computer literacy, this 317-page guide is filled with resource materials. Each volume includes instructional objectives; a complete scope and sequence; and detailed instruction plans, including curriculum area, time and materials required, and a follow-up question. Many activities do not require a computer. Also includes reproducible student activity sheets.

Articles

"The Best Way to Teach Computer Literacy."

Arthur Luehrmann, et al., *Electronic Learning*, April 1984, v.3, n.7, p.37.

Presents a series of articles including: a criticism of the K-12 Computer Literacy Approach, a look at the controversy surrounding computer literacy, a summary of recent state government involvement in framing a definition, and comments by the five members of the magazine's National Advisory Board on the topic as a whole.

"Computer Literacy: The Message is the Medium."

Nancy Via, *Classroom Computer News*, May/June 1983, v.3, n.6, p.42.

Presents an extensive bibliography including books, audio-visual materials, and software on computer awareness and computer languages. Also cites sources for computer literacy materials.

"The Introduction to Computers Course: The Right Place in the Wave."

Carl Swenson, *The Computing Teacher*, February 1984, v.11, n.6, p.26.

Proposes merging two popular computer courses—programming and computer literacy into an introduction to computer usage. The idea is centered on three tenets—focus on well-established aspects, emphasize concepts rather than facts or details, and center on applications students will likely use.

"K-8 Computer Literacy Curriculum."

Bobby Goodson, et al., *The Computing Teacher*, March 1983, v.10, n.7, p.7.

Presents the revised edition of the K-8 computer literacy curriculum for the Cupertino Union School District in California. Breifly describes philosophy and implementation. Curriculum objectives are listed for the following areas: computer awareness, computer interaction skills, computer programming skills, social sciences, language arts, science, and mathematics.

"Mission: Define Computer Literacy."

The Illinois-Wisconsin ISACS Computer Coordinators' Committee on Computer Literacy Report, *The Computing Teacher*, November 1985, v.13, n.3. p.10.

Results of a committee's consensus as to what ought to be included in computer education. Lists comprehensive suggestions from ethics to algorithmic thinking. General sections include computer literacy, scope and sequence, hardware and software selection. The course outline, which was used by the committee in discussions, may be usable by other groups.

"A Model for a Computer Literacy Project."
Susan Sclafani, et al., *The Computing Teacher*, November 1984,
v.12, n.3, p.39.

Describes the Houston Independent School District's comprehensive computer literacy project. High school sophomores are involved in the project which divides literacy into four strands: basic skills, computers as tools, computers in society, and future trends. Seven computer learning centers are detailed as well as teacher training, dissemination, evaluation, and job responsibilities.

"The Plan for Computer Literacy."
Sheila Cory, *SIG Bulletin*, October 1984, v.1, n.4, p.35.

Report based on a 50-member Chapel Hill-Carrboro City School task force. The plan is divided into three stages: a perspective on computer literacy, scope and sequence, and summary of the five-year plan. Includes two goals and objective charts (grades 2-12) which would be a helpful guide.

"Stop Saying 'Computer Literacy'."
Brian Harvey, *Classroom Computer News*, May/June 1983,
v.3, n.6, p.56.

Author questions, "Is there a universally required computer experience?" Explains how the computer literacy concept got started and suggests the practical "right stuff" to teach.

Computer Science

Advanced Placement Test in Computer Science (Pascal)
Elayne Schulman, et al., 1985
Arco Publishing, 215 Park Avenue South, New York, NY 10003,
$8.95

An excellent resource book for Advanced Placement teachers and students. Includes a review of all exam topics, 200 multiple-choice questions, sample AP exams, and a useful set of appendices and bibliography. Also gives teachers a useful survey of topics taught in an AP computer science class.

"Computer Science Exam Finds Wide Acceptance."
Electronic Learning, January 1985, v.4, n.4, p.16.

Reports the acceptance policies of 24 top colleges in granting academic credit for the College Board's Advanced Placement Exam in Computer Science. Discusses problems encountered since the exam was adopted last year, including teacher training in Pascal.

"Large Programs in Advanced Placement Computer Science."
Michael Clancy, *The Computing Teacher*, June 1985,
v.12, n.9, p.60.

Explains that case studies of large programs should be a part of the AP Computer Science Course. Large programs are those with 500 executable lines of code; case studies include the code and a description of design and implementation. Provides rationale, examples of how colleges use them, and a proposal for the AP examination.

"1986 AP Course Description in Computer Science" ($5.00)
"Teacher's Guide to AP Courses in Computer Science" ($5.00)
"Free response Questions, 1984" ($2.00)
"Grading the AP Examination in Computer Science"

"The Entire 1984 AP Computer Science Examination and Key" ($5.00) Whole Packet ($20.00)
Advanced Placement Program, CN6670, Princeton, NJ 08541-6670

The above resources are all the materials available from the Advanced Placement Program for the Advanced Placement Computer Science Test.

"Teaching Pascal: The First Nine Weeks"
"Teaching Pascal: The Second Nine Weeks."
Craig Nansen, *Electronic Learning*, September 1983,
v.3, n.1, p.50 and October 1983, v.3, n.2, p.60.

Explains an 18-week program for teaching Pascal including teacher expectations; suggestions; and a week-by-week outline with objectives, demonstration programs, student activities, and teaching suggestions. Topics include: an introduction to the editor and filer, loops, procedures and turtlegraphics, functions, case statement, characters, long integers, random numbers, and sets, strings, disk input/output, arrays, the binary number system, and records.

Computer Integration—General

Guides

Computers, Curriculum, and Whole Class Instruction: Issues and Ideas
Betty Collis, 1988
Wadsworth Publishing Company, Ten Davis Drive, Belmont, CA 94002, 800/831-6996

This text emphasizes practical applications for whole-class instruction integrating computers. Provides logistical strategies for one computer in a crowded classroom. Based on current research, it is useful to both practicing teachers and curriculum specialists. Contains 120 lesson plans that focus on process skills of inquiry and critical thinking. (From publisher's description.)

Integrating Computing Into the Curriculum
Minnesota Educational Computing Corporation, August 1985
3490 Lexington Ave. North, St. Paul, MN 55112, 612/481-3500, $39.00

A training manual for teaching educators how to integrate computing into general curriculum. Generally, an inservice for teachers who have experimented with a computer class and are now ready for an integration plan. Designed for educators to interrelate what they already know about curriculum, instruction, teaching, and computers. The guide is divided into two sections: instructor notes and classroom materials. The instructor notes include time-frames, instructor materials, class materials, background notes, and activities. The course materials also include reproducible handouts and transparencies. The entire 17 training modules could be taught in 9-10 hours.

MECC Computing and Information Teacher's Guide
Minnesota Educational Computing Corporation, August 1985
3490 Lexington Ave North, St. Paul, MN 55112, 612/481-3500, $49.00

Information literacy course or series used in conjunction with a collection of courseware from MECC. Can be taught as a separate course or integrated in individual segments into existing curriculum areas. Geared to middle school years but portions range from 4-12 grade. The series views information processing skills as basic skills of our age. Material is divided into five sections: keyboarding, composing information, displaying information, accessing information, and evaluating information. Each section includes goals, objectives, lesson plans, and unit tests. The manual describes three different ways to use the series: as a three-, six-, or nine-week course; as a strand throughout the curriculum; or as a self-paced course using activity cards. 194 pages plus 34 student activity cards.

Technology in the Curriculum: A Handbook for Integrating Computers and Related Learning Technologies Throughout the Curriculum
Merrimack Education Center, 1986
101 Mill Road, Chelmsford, MA 01824, 617/256-3985

A practical, in-depth resource for school staff faced with integrating computer technology in the various content areas. Provides a comprehensive program designed in six chapters including overview (with rationale, general concepts), technology in the curriculum, instructional management, staff development, organizing and implementing, program monitoring and evaluation, references, and appendices. Each section provides specific examples and suggestions for implementation. The appendix provides curriculum units prepared for teachers. (Publisher's description).

Articles

"Computers in the Curriculum."
Electronic Learning, September-May 1985, v.4, n.1-8.

An eight-part series introducing computer use across eight curriculum areas: social studies (September), writing (October), foreign languages (November/December), math/problem solving (January), science (February), vocational education (March), business education (April), and art/music (May/June). Each article examines how computer use may enhance classroom teaching, provides practical suggestions in the content area, and looks comparatively at appropriate software.

"Databasing in the Elementary (and Secondary) Classroom."
Kathy Pon, *The Computing Teacher*, November 1984, v.12, n.3, p.28.

Presents the educational possibilities of using the database as a tool in the classroom. Describes a database used by fourth graders studying American Indians and how that information was used in developing higher-order thinking skills. Includes a comparison chart of three database management programs.

"Helping Students to Become Thinkers."
Stanley Pogrow, *Electronic Learning*, April 1985, v.4, n.7, p.26.

Explains the Higher-Order Thinking Skills (HOTS) project involving upper elementary students. Describes the philosophy and curriculum used to teach higher-order thinking skills as well as an evaluation of the project. The first year's experience suggests it is possible to improve higher-order thinking skills while also improving basic skills using computers. Includes lists of hardware and software used.

"How to Manage Effectively with Twenty-five Students and One Computer."
Wayne Phillips, *The Computing Teacher*, March 1983, v.10, n.6, p.32.

Describes classroom computer management models which allow for the successful use of one or two computers in a classroom. Models include total class instruction, timed-use relay, block-time, and nonscheduled formats.

"In Search of a Computer Curriculum"
Priscilla Norton, *Educational Technology*, March 1988, v. 28, n. 3, p. 7.

Explores the evolution of computer curriculum but argues that the current integration model still misses the mark; it fails to recognize potentials and current changes in society. Computer curriculum development is an opportunity to emphasize process and application of knowledge. New competencies for three curricular areas are proposed.

"Software Development Progressing Through Multi-Grade Levels."
Evan Birkhead, *T.H.E. Journal*, October 1985, v.13, n.3, p.12.

Presents current trends in comprehensive, multi-grade level software packages which cover most core and miscellaneous subjects. Describes hardware needs and comments on specific software. Most of these programs are supplemental and typically student record management functions are included. A directory of twenty comprehensive courseware products are listed.

"Software Tools—A One-Semester Secondary School Computer Course."
John Bromley and John Lakatos, *The Computing Teacher*, August/September 1985, v.13, n.1, p.21.

Describes a successful one-semester course designed for students to learn to use the computer as a tool by using commercial software. Purposely designed to encourage less academically able students and although no prerequisites are required, typing skills are recommended. Details course outline, hardware, and software. Topics covered include database, word processing, spreadsheets, Apple operating systems, telecommunications, integrated software, and drawing/graphics. Student evaluation ideas and publishers' guide are also included.

"VisiCalc in the Elementary School."
Jean Wilson, *The Computing Teacher*, June 1985, v.12, n.10, p.29.

Describes lessons on VisiCalc for fifth graders. Suggests ways to integrate VisiCalc into science, mathematics, and social studies curricula and how it may be used as a management tool.

Computer Integration—Subject Area

Language Arts

Computers in Composition Instruction
International Council for Computers in Education, 1984
University of Oregon, 1787 Agate Street, Eugene, OR 97403,
503/686-4414, $6.00

A collection of papers plus selected articles from *The Computing Teacher* using the word processor in the teaching of the writing process. The nine articles discuss three major areas: the writing process, courseware design, and courseware selection.

Computers and the Teaching of Writing
Stephen Marcus, 1984
Apple Education Affairs, 10201 North DeAnza Blvd.,
Cupertino, CA 95014, 408/996-1010, $2.95

This booklet discusses using computers in the teaching of writing. It lists printed resource materials, software, educators involved with computer-assisted writing instruction, and databases which provide software reviews and bibliographies.

"Databases in the English Class: A Valuable Lesson."
Ruthie Blankenbaker, *The Computing Teacher*, October 1987, v.15, n.3, p.17.

Describes a values survey project using a database in a computer class that evolved into a composition activity in the English class.

Hand in Hand: The Writing Process and the Microcomputer
Gail Parson, 1985
Employment and Training Center of Alaska
2330 Nichols Street, Anchorage, AK 99504,
$8.00 + $1.50 handling

Inspiring handbook designed to help secondary teachers make use of word processing and the writing process approach in ALL content areas. Divided into six chapters which discuss the writing process, word processing, hardware and software, teacher and student training, and life in the "revolutionized" classroom. This handbook is based on a year's experiment by ten teachers in Alaska. Teacher commentaries and practical experiences are helpful enough to get any teacher motivated.

Making the Literature, Writing, Word Processing Connection:
The Best of the Writing Notebook, 1983-1987

Sharon Franklin, editor,
Creative Word Processing in the Classroom, P.O. Box 79, Mendocino, CA 95460, 707/937-2848, $17.99

A collection of the best articles from *The Writing Notebook*, a journal that highlights successful classroom writing activities using word processing and integrates current research and theory. Chapters include: Writing and Word Processing, Keyboarding, Writing Using Specific Software, Writing as a Process, Publishing Student Writing, Cooperative Learning, Writing Across the Curriculum, Timely Writing Ideas, Poetry, Curriculum/Study Units, and Computer as Pen Pal.

Teaching Word Processing in the Elementary School
Computer Directions for Schools, May 1984
P.O. Box 1136, Livermore, CA 94550, $7.95 + $2.00 Handling

A comprehensive guide for using word processing with elementary school students. Describes practical organization ideas including choosing a word processing program, how to begin, sample lessons, and creative projects such as a school newspaper and pen pals. Lists word processing and support software available.

Teaching Writing With a Word Processor
Minnesota Educational Computing Corporation, August 1985
3490 Lexington Ave. North, St. Paul, MN 55112, $49.00

Designed for a trainer to provide language arts teachers with philosophical and concrete ideas using the word processor as a tool to improve writing instruction. Objectives include learning a word processing program, identifying the advantages and disadvantages of using the word processor, designing lesson plans, as well as identifying prerequisites, impacts, and issues. Includes presenter's notes, materials, computer activities, timeframes (six-, three-, or one-hour presentations), and transparency and handbook masters. Uses the MECC Writer word processor, but could be adapted to be used with others. Looks at various stages in the writing process: prewriting, drafting, editing, word processor as a tool, and implementation issues.

"Using a Database in an English Classroom."
Joan Dunfey, *The Computing Teacher*, November 1984, v.12, n.3, p.26.

Describes possible uses of a language arts database: to research a project, create a student guidebook, list student review of books, coordinate yearbook editor information, and collect student poetry. Describes criteria for choosing project topics, the importance of students' thinking skills when setting up a database, and questions to ask when choosing software.

Mathematics

Computers and Math

Walter Koetke, 1986
Scholastic, Inc., P.O. Box 7502, Jefferson City, MO 85102,
800/325-6149

Student Text (hard cover)	$ 15.95
Teaching Guide	10.95
Program Disk	19.95

A course for grades 8-12 that blends traditional topics of math with the computational methods provided by the computer. The goal of the course is teaching students to become better problem solvers as they use the computer and structured programming in BASIC to solve real world problems.

Computers in the Mathematics Curriculum

Minnesota Educational Computing Corporation, August 1984
3490 Lexington Ave North, St. Paul, MN 55112,
$31.00

Designed for computer coordinators and mathematics specialists to provide secondary mathematics teachers with an overview of the uses of computers in mathematic curricula. Outlines teacher prerequisites; specifically some computer experience, and ideally, programming in BASIC and Logo. Presents goals, objectives, logistics, suggested training formats, and planning guide. Includes 12 modules, each of which includes timeline, materials, objectives, background information, and activities. Transparency masters; handout masters; and extensive appendices of references, sources, and services are also included.

Computers in Mathematics Education

National Council of Teachers of Mathematics, 1984
1906 Association Drive, Reston, VA 22091, $16.00

A collection of articles for mathematics teachers at all levels. Comprehensively covers philosophical and ethical issues in using the computer, the computer as a teaching aid, teaching mathematics through programming, diagnostic uses of the computer, and a selected bibliography about computers in classroom use.

"Integrating Software into a Math Curriculum (K-8)."

Jill Searcy, *AEDS Monitor*, July/August 1985, v.24, n.1-2, p.17.

Summarizes a study which presents educational software programs that support math curriculum objectives, K-8. Includes hardware decisions, choosing appropriate software, and a computer-use schedule.

Problem Solving: Application of Computers in the Curriculum

SEMTEC Project, 1985
IICD—Oakland Schools, 2100 Pontiac Lake Road, Pontiac, MI 48054,
313/858-2121, $10.00

A complete guide for workshop leaders and mathematics teachers of grades 2-6. Teacher goals include writing a definition and rationale for problem solving, and examining software for classroom use. Includes the workshop overview, outline, teaching script, and six extensive, high-interest lessons teachers can use in their classrooms. Complete with lesson plans; ways to utilize software; follow-up activities (in other content areas including art, language, social studies, Logo); teacher reference sheets; reproducible worksheets and transparencies; materials information; and a list of suggested reading.

The Use of Computers in the Learning and Teaching of Mathematics

National Council of Teachers of Mathematics, 1987
1906 Association Drive, Reston, VA 22091, free

This latest policy statement adopted by NCTM calls for increased emphasis on the computer as instructional aid, not object of instruction. (Also available is a report on a survey of state-level technology policies.)

Utilizing Computers in Teaching Secondary Mathematics

Asbury Park Board of Education
1506 Park Avenue, Asbury Park, NJ 07712, 201/776-2619,
$150.00

A school district's popular and highly successful computer math program which offers schools a quick way to integrate computers in all math classes, grades 9-12. The package has 44 computer teaching units (using Apple or TRS-80) for six courses: General Mathematics, Algebra I, Algebra II, Geometry, Trigonometry, and Calculus. Resource manuals list program names, worksheets, and topics. An excellent way for a school to integrate computers into a four-year math curriculum. Training for this program takes only three hours, and no additional staffing is needed. All disks, manuals, and tests are reproducible. The package includes six disks and teacher manuals (one for each subject area), and tests. (A free brochure explaining this package is available by contacting Christine Wight at the above address.)

Science

"Buyer's Guide to Educational Science Software."
Christopher O'Malley, ed., *Personal Computing*, September 1984, v.8, n.9, p.94.

The article opens with a discussion of how technology can help science education and follows with a listing of over 175 science software packages. Includes price, hardware, subject, age group, and brief description.

"Choosing Software for a High School Chemistry Class."
Patricia McCollom, *T.H.E. Journal*, October 1985, v.13, n.3, p.90.

Presents logistics of classroom management, hardware, choosing topics, and suggests software packages. Also establishes rules and procedures: never leave the "hacker" alone with the computer, avoid timed programs, minimize the times students handle the disks, and cover the computers when not in use.

Computer Lab Tools for Science: An Analysis of Commercially Available Science Interfacing Software for Microcomputers
Dave Weaver, 1986
Northwest Regional Educational Laboratory, Document Reproduction Service, 101 S.W. Main Avenue, Portland, OR 97204, 503/275-9500, $12.65

An 80-page document that describes 30 commercially available lab interfacing systems. Sixteen of the thirty are evaluated in five catagories: hardware, supplementary materials, experiments, data display and analysis features, and ease of use.

"The Database as a Resource in the Science Classroom"
Janet Woerner, *The Computing Teacher*, December 1987, v.15, n. 4, p. 20.

Describes a three-lesson, database activity on mineral identification. Includes information on ordering the free AppleWorks data file of 127 minerals from the author.

"How to Use the Computer in Science Class (and How Not To)."
Michael Rossman, *Classroom Computer Learning*, February 1984, v.4, n.7, p.13.

A science teacher describes his reservations about using computers in elementary science. His concerns include the danger of removing students from real experiences with phenomena or from the hard work of manual data gathering. He argues for carefully choosing first-rate uses of computers and describes examples.

"Integrating Computing Into Science Instruction."

James Okey, *The Journal of Computers in Mathematics and Science Teaching*, Winter 1984/85, v.4, n.2, p.14.

Explores the computing skills that science teachers need to effectively use computers in their teaching. Also recommends the research and development efforts for the future of computing.

"Science Software in High-Button Shoes".

Odvard Egil Dyrli, *Classroom Computer Learning*, February 1984, v.4, n.7, p.30.

A lot of science software is based on outdated content and memorization but recent developments are encouraging; process-oriented science software exists and more is appearing. Describes five examples of process-centered software.

"Studying Projectile Motion with a Spreadsheet"

George Kolodiy, *Journal of Computers in Mathematics and Science Teaching*, Summer 1987, v.6, n. 4, p. 40.

Describes a spreadsheet that studies the effect of controlling the initial angle and velocity of a fired projectile on the maximum height reached. Includes step-by-step instructions for creating the AppleWorks template.

Social Studies

"Build Your Own Computer Simulations."
Roy Tamashiro, *The Computing Teacher*, November 1985,
v.13, n.3, p.36.

Presents a model in which teachers can build customized, concept-oriented simulation lessons. Teachers who possess some computer language skill can develop a simulation program, lesson plan, and student worksheets. The model has five steps: selecting topic and gathering resources, developing objectives and lesson activities, selecting and formulating simulation factors, interactions among condition variables and decision options, entering the program, and creating student worksheets. The program code is included in the article.

Computing in the Social Studies Classroom
Allen Glenn and Don Rawitsch, 1984
International Council for Computers in Education, University of Oregon, 1787
Agate Street, Eugene, OR 97403-1923, 503/686-4414, $3.50

Presents guidelines for social studies teachers interested in using the computer in their content area. Discusses how computers can be used in social studies: specific applications, rationale and needs, materials and material evaluation criteria, plus a look at how computer use in social studies fits into a school's overall instruction plan.

Personal Computers and Social Education
Beverly Hunter, 1984
Apple Education Affairs, 10201 North DeAnza Blvd.,
Cupertino, CA 95014, $2.95

Explains how various computer uses may provide a powerful tool in teaching social studies. Presents nine positive teaching experiences using the computer; and a thorough resource list including print materials, tools, and social studies software packages dealing with topics from economics to population.

Ethics

"Computers and the New Culture: Where are the Role Models?"
Douglas Flaherty, *Educational Technology*, June 1985, v.25, n.6, p.34.

Technical advances and societal changes have reduced student use of human role models. The author discusses these changes and seven procedures for returning these models to the classroom.

"Ethics and Computer Use."
Kay Gilliland and Mattye Pollard, *The Computing Teacher*, August/September 1984, v.12, n.1, p.19.

Describes an activity for teachers and students to help decide what is right and wrong in computer use. Suggests 16 provocative situations for discussion involving ethical problems students and teachers may encounter. Explains EQUALS (a staff development program to promote equity) and lists other ethical questions which may be addressed.

"The Online Underworld."
Len Scrogan, *Classroom Computer Learning*, February 1988, v.8, n.5, p. 58.

Designed to raise awareness of online computer crime, defines terms and concepts: online piracy, hacking, phreaking, online crime, destruction boards. Describes a five-step process to communicate the ethics of the online world and the conventions of online behavior.

Equity

IDEAS for Equitable Computer Learning
Center for Educational Equity
American Institutes for Research, P.O. Box 1113, Palo Alto, CA 94302, $15.00

Contains practical strategies for addressing 12 barriers to equity in learning with computers. Suggestions on content and format were made by educators. For each barrier the folowing is provided: illustrations of actual experiences and assessments. Resources include: reproducible computer survey for readiness; out-of-school computer access; and a bibliography on current resources on gender equity and computers.

"Lowering the Barriers to Computer Use."
William Harvey and Dean Ginther, *The Computing Teacher*,
April 1984, v.11, n.8, p.45.

Describes computer adaptations teachers of handicapped students can make, including: adapting the classroom, selecting and modifying software, and configuring hardware for handicapped learners.

The Neuter Computer: Computers for Girls and Boys
Jo Schuchat Sanders and Antonia Stone, 1986
Neal-Schuman Publishers, 23 Cornelia Street, New York, NY 10014,
$22.95 + $3.44 postage and handling

A collection of 56 high-interest activities and 96 strategies for computer equity that encourage girls and boys to use and to continue to use computers. Lists guidelines for planning and evaluating the level of computer equity in a school.

Off and Running
EQUALS Project
Lawrence Hall of Science, University of California,
Berkeley, CA 94720, 415/642-1823, $12.50 + 1.00 Handling

EQUALS in Computer Technology is an in-service program developed to increase educators' awareness of the importance for females and minorities to acquire computer competence. This collection of activities highlights important computer concepts including procedural thinking, planning and programming, and logic operations. This guide demonstrates how these concepts have a place in everyday life outside of computing. None of these activities require computer use. Also explores computer-related issues such as software ethics, history of computing, computer careers, and equitable access. Activities include ethics role-play, flipbooks, attribute machines, robots, historical landmarks, cooperative logic, and programming.

"Practical Solutions to Overcoming Equity in Computer Use."
Jane Schubert and Thomas Bakke, *The Computing Teacher*,
April 1984, v.11, n.8, p.28.

Describes the first part of an ongoing study aimed at reducing the gender gap in computer use and access. Illustrates actual incidents and is comprehensive.

"Sorting Out the Equity Issues."
Fran Reinhold, *Electronic Learning*, February 1985, v.4, n.5, p.33.

Explores possibilities for equal access to computers by topic: defining the problem, getting and spending funds, community support, and home-school connection. Describes the comprehensive, large-scale equity plan in the Houston Independent School District.

Keyboarding

"A Comparative Study for Teaching Typing Skills on Microcomputers."
Robert Lindsay, Educational Research Institute of British Columbia, May 1982, ED 220 597 (See page 13, Chapter 1 for ordering ERIC documents.)

Results of a study done in four introductory typing classes designed to compare the effectiveness of keyboarding skill building using either the microcomputer or the electric typewriter. The computer was found to be as effective as the typewriter in increasing typing speed and accuracy. Also included is a review of literature, recommendations, and future research.

"Is Typing the Key to Computer Literacy?"
Donna Craighead and Mary Ellen Switzer, *Instructor,* September 1983, v.93, n.2, p.178.

A practical guide for teaching how to type, along with reviews of typing software. Explains introductory typing activities, games for beginners, software for the very young, and touch-typing software.

"Keyboarding—A Must in Tomorrows' World."
Evelyn Kisner, *The Computing Teacher,* February 1984, v.11, n.6, p.21.

Defines keyboarding, then discusses rationale, appropriate teachers and grade levels of introduction, implementation, and desired levels of efficiency.

"Keyboarding, Language Arts, and the Elementary School Child."
Ernest Balajthy, *The Computing Teacher,* February 1988, v.15, n.5, p.40.

After citing research that favors early keyboard instruction, author lists considerations for planning keyboard instruction, including its effectiveness when integrated in language arts activities. Concludes with description of five software titles that teach keyboarding well.

"Keyboarding: The State of the Art."
June Schmidt, Virginia Polytechnic Institute and State University, October 1983, ED 236 352 (See page 13, Chapter 1 for ordering ERIC documents.)

Places the responsibility of teaching keyboarding skills on the business education teacher and points out advantages of teaching keyboarding with the microcomputer. Explains why keyboarding should be taught to all students, not just business majors. Discusses materials and equipment, including using a traditional typing book. Lists student competencies for a keyboarding curriculum and a rationale.

"Keyboarding Skills: Elementary, My Dear Teacher."
Keith Wetzel, *The Computing Teacher*, June 1985, v.12, n.9, p.15.

Explains that keyboarding skills are too important to be left to chance. Answers keyboarding questions on criterion, amount of instruction, time needed to reach proficiency, and how it should be taught. Also describes hardware, curriculum, principles, organization, and evaluation of keyboarding as well as recommendations.

"Two Hands Is Hard for Me: Keyboarding the Learning Disabled Student."
Susan Neuman and Catherine Cobb Morocco, *Educational Technology*, December 1987, v.27, n.12, p. 36.

Describes study of 14 learning disabled (LD) students who practiced keyboarding and word processing. Observations suggest that LD children need systematic training in keyboarding. Three guiding principles are discussed: brief and frequent keyboarding lesson, ongoing monitoring of finger placement, and elimination of the need to move eyes from the monitor.

"Who Needs Ten-Finger Typing?"
Holly Brady, *Classroom Computer Learning*, September 1984, v.5, n.2, p.64.

Discusses the new emphasis on touch-typing in education and describes how to choose the best typing tutorials. A comparison chart lists seven software packages including publisher, hardware, price, grade level, on-screen instruction, typing practice, feedback to learner, upper and lower case, and teacher authoring. Side article discusses various keyboards.

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3. STAFF DEVELOPMENT

OVERVIEW

In this chapter, staff development refers to all activities that relate to program support by school personnel. This includes: creating and supporting special staff positions (staffing), training, and preparing a staff development program.

Staffing Considerations

Program coordination. In districts with established technology programs, it is typical to have special staff positions for program coordination. In large districts, there are both district and building level coordinators. Some districts recommend a building-level coordinator for every school with 15 or more computers. Either position may be full-time or involve time during the day that is free of teaching responsibilities.

Coordinator duties. Computer coordinators manage all components of the technology program. Their duties fall into five areas and may include any combination of the following:

- Administration
  - curriculum planning
  - budgeting
  - facility planning
  - supervision
  - public speaking
  - consulting
- Teaching
  - students
  - teachers
  - parents and community members
- Software management
  - selecting software
  - evaluating software
  - managing the software collection
- Technical support
  - selecting hardware
  - ordering hardware
  - managing hardware
  - troubleshooting and minor repair
- Communications and outreach
  - serve on advisory boards
  - prepare newsletters
  - develop proposals

Coordinator qualifications. The ideal computer coordinator will possess the same variety of skills and experiences as indicated in the list of possible duties. The relative importance of the following list of qualifications will depend on a district's intentions for the coordinator position.

- A broad knowledge of school curriculum areas and curriculum development
- Experience with a variety of instructional applications of computers
- A knowledge of courseware evaluation, previewing techniques, and courseware management
- Experience with different computer systems and peripherals
- Knowledge and experience with software and hardware troubleshooting
- Previous classroom teaching experience and knowledge of classroom management techniques
- Good interpersonal, communication, and organizational skills, including public speaking experience
- Some administrative or supervisory experience
- Experience creating and managing a budget
- Ability to organize and lead instruction for adult learners
- Some formal training in computer science
- Working knowledge of at least one computer language used in educational settings
- Ability to identify resources and delegate responsibility to support personnel
- Knowledge and ability in fundraising and grant proposal writing

Computer educators. As a district technology program matures, other staff should be encouraged to take leadership roles. Often a certain core group of teachers develops a level of expertise above that of the rest of the faculty. This group of teachers may be responsible for teacher inservice or for instruction in computer science courses. Many districts support the professional development of such computer educators, providing incentives for pursuing formal education in computers in education or computer science. Many universities and colleges offer graduate degree programs. Some districts have set up their own computer educator certification system, providing bonuses and other incentives for completing additional computer training.

Teacher user groups. Teachers with similar teaching responsibilities benefit from the opportunity to interact and share ideas, strategies, and resources through user groups. Certain lead teachers can take on peer coaching responsibilities within these groups, supporting the novice computer using teachers. Such groups can exist within a district or across several districts. The formation and organization of such programs can be initiated as part of the staff development program.

Community volunteers. Members of the community may have experience and skills they are willing to share. A district can communicate its interest in a volunteer program as part of communication and outreach. Volunteers may be highly trained technology professionals who can assist with training or provide consultation during planning. Volunteers with little technology experience can assist as lab aides or in other areas of program management.

Student tutors. Students are a potential resource that can be tapped to support the training and staffing needs of a program. They can be useful assistants in staff development and inservice; their enthusiasm helps motivate teachers. Secondary level students can help at the elementary levels in classrooms or during after school clubs. Students with computer expertise can also be trained as peer tutors or computer lab aides.

Trainers

It is advantageous for a district to have staff with sufficient expertise to conduct all its own training in-house. This may be the goal for a new technology program because until the staff includes a core of trainers, training may have to come from outside sources. The following is a list of general sources for training provided outside of the district.

Outside training sources.

- Hardware vendors—This training is hardware specific and comes from trainers who may not be acquainted with the needs of educators. This is not a recommended source unless it is intended to be specialized training for maintenance or other technical information.
- Private consultants—This source should be able to verify experience and background with the special needs of education. Trainers should be educators with classroom experience.
- Regional education centers—Many of the regional education centers (ESDs, ISDs, BOCES, etc.) have technology programs which maintain a teaching lab and software library. The staff conducts a regular program of onsite training.
- Institutions of higher education—Most community colleges, colleges, and universities offer some kind of computer education. They may also be a source for trainers who deliver onsite inservice. Obviously, those institutions with programs specifically for teacher education offer more relevant courses. Watch for institutions that do not maintain a collection of educational software. Courses at such places may emphasize programming which is not appropriate for beginning experiences.
- Additional sources—There are several self-study packages available from commercial sources. Some of these have a multi-media approach and are very well done. Certain phases of the staff development could make use of these and reduce the labor intensiveness of training.

Teacher Support

Access to computers. As the training program begins to reach the teachers it is important that computers are available for them to explore and take advantage of the capabilities of the technology. The following are two strategies to consider:

- Teacher workstations—Maintain a teachers-only workstation for software preview, materials development, etc.
- Home loan—Check out computers to teachers for holiday and vacation periods.

Incentives. Teachers should be provided with incentives to seek training. For example:

- Release time
- Remuneration for tuition
- Salary credit or bonus
- College credit

Training Session Content

Inservice content should be organized by levels and courses. There are novice, intermediate, and advanced levels as well as several different topic areas in many staff development plans. In general, advanced training sessions are aimed at more specific audiences with the lower level sessions reaching a broader segment of the staff. All training should include a lot of hands-on opportunity. It is also very important to develop a system of follow-up support for newly trained staff. They will need assistance and encouragement with new materials and skills.

The following is a list of possible topics organized by level of expertise. The set of topics at a given level are not intended for a single training session.

Novice level.

- Basic computer and peripheral operation
- Disk handling procedures
- Survey of educational software
- Introduction to applications: word processing, database management, and spreadsheet analysis
- Integration strategies
- Copyright protection issues
- Materials generation with computers
- Introduction to programming: Logo, Pascal, BASIC

Intermediate level.

- Software selection and evaluation
- Subject area applications
- Matching software to curriculum, student needs, and styles
- Integrating word processing, database management, and spreadsheet analysis
- Integrating programmming activities into the classroom
- Additional technologies: telecommunications, videodisc, robotics
- Fundamentals of courseware design: authoring systems or languages
- Advanced teacher utilities: gradebooks, testing, etc.

Advanced level.

- Computer science and teaching computer science
- Software design and modification
- Design and development of activities that integrate technology

Planning Staff Development

1. Identify competencies needed by staff to implement the curriculum

Identify the required staff competencies for implementing student goals and objectives outlined in the curriculum. Specify the number, grade level, and subject area of the staff requiring each competency.

2. Determine existing competencies

Use the results of the inventory of staff expertise taken in general program planning to determine courses and topics to include in staff development.

3. Organize competencies and set priorities for staff development

Group competencies into levels and training sessions. Set priorities and develop implementation timelines for training.

4. Develop training sessions

- Select the trainers
- Design the syllabus
- Prepare activities and materials
- Schedule the sessions

5. Provide additional staff development

- Memberships in educational computing associations
- Stipends for attending technology conferences
- Subscriptions to major periodicals
- Leave time for observing other classrooms using technology
- Support of teacher user groups for sharing ideas and strategies

6. Implement, evaluate, and review staff development program

Use questionnaires, follow-up observation, self-assessment, and peer evaluation to review the effectiveness of the staff development activities. Keep the staff development program in tune with the changes in the district technology program and the field of educational technology.

CHECKLIST

Staffing Considerations

Notes

__________ 1. Program Coordination

- Coordinator duties
  - Administrative
  - Teaching
  - Software management
  - Technical support
  - Communication and outreach
- Coordinator qualifications
  - Curriculum expertise
  - Technology expertise
  - Managing expertise

__________ 2. Teacher educators

__________ 3. Teacher user groups

__________ 4. Community volunteers

__________ 5. Student tutors

Trainers

__________ 1. In-house trainers

__________ 2. Outside trainers

- Hardware vendors
- Private consultants
- Regional education centers
- Institutions of higher education
- Self-study packages

Teacher Support

Notes

_________ 1. Access to computers

- Teacher workstations
- Home loan program

_________ 2. Incentives

- Release time
- Remuneration for tuition
- Salary credit or bonus
- College credit

Training Session Content

_________ 1. Organized by levels and courses

_________ 2. Focused on specific audiences

_________ 3. Includes a lot of hands-on experience

_________ 4. Follow-up support available

_________ 5. Novice level

- Basic operations
- Survey of educational software
- Introduction to word processing, database, and spreadsheet
- Integration strategies
- Teacher utilities for material generation
- Introduction to programming

_________ 6. Intermediate level

- Software selection/evaluation
- Subject area applications
- Matching software to curriculum

Notes

Training Session Content (cont.)

- Integrating word processing, database, and spreadsheet
- Additional technologies
- Authoring systems or languages
- Advanced teacher utilities

_________ 7. Advanced level

- Computer science and teaching computer science
- Software design and modification
- Design and development of activities that integrate technology

Planning Staff Development

_________ 1. Identify competencies

- Identify staff competencies needed to reach curriculum goals and objectives
- Specify number, grade level and subject area of those needing each competency

_________ 2. Determine existing competencies

- Analyze existing staff expertise
- Identify needs

_________ 3. Organize competencies

- Group-related competencies
  - By level
  - By training session
- Set priorities
- Develop training timelines

6

Planning Staff Development (cont.)

Notes

_________ 4. Develop training sessions

  - Select trainers
  - Design syllabus
  - Prepare activities and materials
  - Schedule sessions

_________ 5. Provide additional staff development

  - Membership in computing associations
  - Attendance at conferences
  - Subscriptions to computing periodicals
  - Teacher user groups

_________ 6. Implement, evaluate, and review staff development program

  - Provide for ongoing review and update of program

RESOURCES

Staffing

The Computer Coordinator
David Moursund, 1985
International Council for Computers in Education (ICCE),
University of Oregon, 1787 Agate Street,
Eugene, OR 97403-1923, 503/686-4414, $10.00

This manual provides guidance for educators desiring a computer coordinator position, for those who are already coordinators, and for a coordinator hiring committee. Topics include coordinator needs, responsibilities, and qualifications; and computer coordinator as computer scientist, computer-assisted learning specialist, and computer-integrated instruction specialist. Includes helpful sample interviews with position descriptions, qualifications, and questioning strategies.

High Tech/High Touch
David Moursund, 1985
International Council for Computers in Education (ICCE),
University of Oregon, 1787 Agate Street,
Eugene, OR 97403, 503/686-4414, $16.00

A manual containing information used in leadership workshops for coordinators, teachers, workshop leaders, and teachers of teachers. The goal is to combine "High Touch" ideas from the fields of personal growth/transformation and psychotherapy with High Tech ideas associated with computer use. Workshop features include: people and computers in problem solving, interpersonal skills development, computer based information systems, personal growth, and stress and burnout prevention. (Publisher's description.)

"Preparation to Be a Computer Coordinator."
David Moursund, *The Computing Teacher,* November 1984, v.12, n.13, p.3.

Describes duties a computer coordinator is apt to have and details four major competency areas. Points out that this is a high-stress job and that demands on a coordinator tend to be overwhelming. Lists several characteristics successful coordinators possess.

"School Administration and Technology: Planning Educational Roles."
Gregory Church and Michael Bender, *Educational Technology,*
June 1985, v.25, n.6, p.21.

Expresses a need for a planned approach to implement computer based educational programs. This model is based on the Administrative Integration Model (AIM) which places emphasis on levels of interaction. Explains roles of the administrator, computer coordinator, and so forth.

Student Involvement—Implementing A Computer Tutor Program
Computer Directions for Schools, September 1984
P.O. Box 1136, Livermore, CA 94550, $7.95 + $2.00 Handling

This useful guide explains how to organize a Computer Tutor program. Students assist other students in loading, running, and using educational software. This manual covers, step-by-step, how to recruit, train, motivate, and implement tutors in classes throughout the school. Useful sample letters to parents and staff members are included. While designed for an elementary school, these ideas are highly adaptable to the high school level.

Teacher Certification

Curricula Recommendations for Secondary Schools and Teacher Certification
Association for Computing Machinery, 1985
P.O. Box 64145, Baltimore, MD 21264, $9.00

Recommendations of a task force of secondary and university teachers, computer specialists, and computer science education specialists. Presents two curricula: computer science to be taught at the secondary level, and programs leading to teacher certification in computer science. The secondary curriculum description includes goals, objectives, and topics. The certification curriculum provides proposed curriculum, programming languages, and curriculum validity. This would be useful to a school or school district interested in implementing a computer science curriculum or teachers/planners preparing for computer science certification. (Also appears in *SIG Bulletin*, July/August/September 1985, v.2, n.1.)

"Incorporating Computer Education into Teacher Education: A Model."
Charlotte Scherer, *SIG Bulletin*, October/November/December 1985, v.2, n.2, p.31.

Describes specific classes to be included in undergraduate teacher training: a course on educational computing, an elective, and a revision of educational courses to include computers as an instructional mode. Discusses training both faculty and the undergraduates. Details a college computer lab designed for the teacher education program and provides a list of computer classes in the teacher education program.

"Let's Prepare Computer Educators—NOT Computer Science Educators."
Judith Jacobs, *The Computing Teacher*, August/September 1985, v.13, n.1, p.17.

In reaction to the NCCE recommendations for teacher certification in computers, proposes another category of computer educators—those who use computers for instructional purposes exclusively or in addition to programming. Describes 15 competencies such a teacher should possess.

"Preparing Computer-Using Educators."
Margaret Moore, *The Computing Teacher*, October 1984, v.12, n.2, p.48.

Describes a five-stage model used for writing competencies for computer-using educators. Written by the Northwest Council for Computer Education (NCCE), it lists competencies for general certification, computer science for elementary, computer science for high school, and computer science for coordinators. Distinguishes between teachers who use computer technology and those who teach about computers.

"Six-Packs for Computer Literacy: An Approach for Preservice Teachers."
Pamela Farris, Dorothy Judd, and Nancy Vedral, *The Computing Teacher,* November 1984, v.12, n.3, p.36.

Explains six STUDY-PACS curricula created by Northern Illinois University, to provide computer literacy for teacher education majors. Describes objectives and the three semester-long courses. Also included is a reading list.

"A Study of Universities Offering Graduate Degree Programs in Computers in Education."
Leticia Ekhaml, *T.H.E. Journal,* October 1985, v.13, n.3, p.98.

Describes results of a survey analyzing aspects of graduate degree programs in computers in education. Lists colleges and universities offering graduate degrees.

"Teacher Training: Preparing for the Fifth Basic."
Allen Cameron and Donna Craighead, *AEDS Monitor,* November/December 1984, v.23, n.5/6,p. 23.

Stresses the importance of coordinating college education, computer science, and content departments for teacher training in computer use. The two primary sources for teacher training are college education and computer science departments, each of which has a different teaching philosophy.

"What Are the Issues for Teacher Training?"
Lynn Fontana and Anne Ochoa, *NASSP Bulletin,* April 1985, v.69, n.480, p.15.

Discusses the importance of moving schools into an age of electronic communication. Presents a set of fundamental questions for educators, four basic issues to help advance technology in education, and ways of teaching in the information age. Describes strategies school principals might consider.

Training Session Content and Techniques

Note: There are several resources for training in Chapter Two, Resource Section pages 26-48.

Boot Your System
Buhl Science Center, Allegheny Square,
Pittsburgh, PA 15212, $19.95 + $1.30 Handling

An in-service guide designed to teach educators the "basics" of using the computer in the classroom. Workshops could be structured from one-half day to five full days using these activities. Five school situations are presented typifying a range of experiences. Activities are then chosen to correspond with the educators' expertise. Includes activity handouts.

Computer Courses for Adults (Anxious Human Meets Computer)
Anthony Allen, 1984
International Council for Computers in Education (ICCE),
University of Oregon, 1787 Agate Street,
Eugene, OR 97403, 503/686-4414, $10.00

A practical resource book for instructors intending to teach adults about computers. Parts I and II discuss current practices and theories in adult education and possible improvements. Part III provides feedback and recommendations of adult students, instructors, and theoreticians. Part IV presents ways instructors may increase their effectiveness.

"Computer Teacher Preparation."
LeRoy Finkel, *The Computing Teacher*, December/January 1984-5,
v.12, n.4, p.22.

Discusses the NCCE teacher certification guidelines in computers and their limitations. Endorses separate competencies for teachers emphasizing different computer uses. Describes a computer coordinator's role as primarily administrative and lists useful skills. Philosophical look by a computer curriculum coordinator of 23 school districts.

"Concerns of Teachers About Educational Computing."
John Wedman and Marvin Heller, *AEDS Journal*, Fall 1984, v.18, n.1, p.31.

Results of a study done to assess and describe the effective needs of teachers seeking computer education inservice. Of interest to inservice planners who may be designing educational computing inservice inappropriate for teachers. Stresses the importance of considering both content and concerns of teachers.

The Cupertino Concept: Computer Literacy
Cupertino Union School District
10310 Vista Drive, Cupertino, CA 95014, 408/252-3000,
$50.00 (Information packet free)

Describes a comprehensive program for preparing schools to infuse technology into the curriculum. Includes three areas of training: long- and short-range planning (philosophy, goals, policies, implementation plan); staff development (course design, internal resources, incentives, teacher network); and computer literacy curriculum (scope and sequence, lesson plans, student activity pages, integration of software ideas). Also includes guidelines for hardware and software selection, a staff development program, curriculum and instructional materials development, and equity guidelines. (Project also provides two-day on-site training.)

Faculty Computer Literacy In-Service
MICROMAC
Rosemount High School, 1445 Diamond Path, Rosemount, MN 55068
612/423-9301, $25.00

MICROMAC is a model computer technology program at a secondary school which uses computers in every office and in almost every classroom. This is a utilitarian computer literacy inservice guide for the school's faculty. It is a series of specific activities intended for teachers and includes verification, timeline, due dates, a reproducible document for faculty, and possible inservice credit. Could easily be adapted for any faculty at any grade level since the purpose is for the faculty to become "computer literate." Also includes a testing disk.

High Tech/High Touch: A Computer Education Leadership Development Workshop
David Moursund, 1985
International Council for Computers in Education (ICCE),
University of Oregon, 1787 Agate Street,
Eugene, OR 97403, 503/686-4414, $16.00

Describes a 15-session workshop on leadership development for computer coordinators and computer education teachers. Each session includes: statement of goals, information on the session topic, and individual or group exercises. Session topics include: active listening, leadership traits, higher-order thinking skills, problem solving, stress and burnout, goals of computer education, and keeping up. (Also available from ERIC, ED 270 091, see page 13, Chapter 1 for ordering information.)

"Making Workshops Work."
Joan Westley, *Classroom Computer Learning*, April/May 1985,
v.5, n.8, p.50.

Research indicates most teachers attending computer workshops don't make use of the technology once back in the classroom. Top inservice educators describe the typical pitfalls in conducting workshops. Topics include: inappropriate focus, too little or too much, hardware inaccessibility, lack of intensity, lack of followup, classroom management problems, and inadequate incentives.

"Microcomputers in the Classroom—What are the Elements of Inservice Workshops for Teachers?"
Robert Tauber, *NASSP Bulletin*, April 1985, v.68, n.471, p.9.

Provides a rationale and summary of a six-hour workshop, stressing packaged software over programming. Describes instructor preparation, and a helpful outline including time structure.

New Horizons

Darryl Sink and Associates Inc., 1983
1155 North First Street, Suite 201, San Jose, CA 95112,
408/297-3900, $1595.00

A multi-media kit for training teachers (K-12) in computer technology. Designed for teachers with little or no computer experience. Can be used by individuals or groups. Included are six videocassettes, fifteen disks with backups, a leader's guide, and a participant's guide. The eight sequential teaching modules include: "Meeting Your Micro and the World of Computing," "What the Computer Can Do for You—Parts I and II," "Matching the Computer to Your Curriculum," "Methods for Managing the Computer in the Classroom," "Evaluating and Selecting Software," "Creating Your Own Software," and "Keeping in Touch." Each of the eight modules are comprehensive; including summary, goals, prerequisites, objectives, materials, preparation lists, activities, and glossary. The videocassettes, disks, and participant's guide are used extensively in each module.

"A Road Atlas for Computer Literacy and Teacher Training."
William Baird, *The Computing Teacher,* November 1984,
v.12, n.3, p.11.

Describes a scenario of a failed computer literacy inservice and then lists concerns which may be used to design successful teacher training courses. Topics include: levels of concern, need for skills, and proficiency. Stresses the necessity of a working definition of computer literacy and that some release time should be given for hands-on work.

"Staff Development for Instructional Uses of Microcomputers."
Cathleen Stasz and Richard Shavelson, *AEDS Journal,* Fall 1985,
v.19, n.1, p.1.

Recommends topics and organization of preservice and inservice teacher training in computer use. Presents theory and research for staff development and recommendations made by 60 mathematics and science teachers.

"Teacher Inservice on Computer Awareness: A Staff Development Project".
Thomas Howell, *SIG Bulletin,* October/November/December 1985,
v.2, n.2, p.25.

Describes a workable, hands-on two-year inservice program for computer orientation. The first year emphasizes teacher involvement with the computer and the second year includes teacher "experts" demonstrating selected pieces of software applicable to individual classroom situations. There are seven three-hour workshops in the first year, each self-contained. Workshops include very practical applications using a word processor, database, teacher utilities, Logo, Computer Assisted Instruction, and an introduction to an interdisciplinary unit. The second year curriculum looked at new teacher utilities and worked more with a word processor, plus the "teacher expert" program in which teachers demonstrated one piece of software. Third year plans are briefly outlined.

"Teacher Training: A Novel Approach."
Bob Rewak, *CUE Newsletter*, December 1985, v.8, n.3, p.11.

Describes a unique, successful computer education teacher training program in California's Redwood City School District of 7000 students. Every participating teacher attends thirty hours of district-sponsored computer classes and, upon completion, receives a complete computer system for his/her classroom. The budget per year for 25 teachers is $25,000. Describes selection lottery, followup, waiver, and computer usage policies. While taking classes over a period of six months, teachers were allowed to keep their computers at home, which was an excellent incentive.

Tech Team: A Teacher-Technology Partnership
Houston Independent School District, Department of Technology,
5300 San Felipe, Houston, TX 77056, 713/960-8888, $15.00

A strategic planning document which analyzes the inadequacies of the traditional instructional delivery system evident in such symptoms as basic skills deficiencies, teacher supply problems, and the math/science crisis. Paper then outlines goals and strategies for restructuring education to include technology in which the teacher functions as a manager of interactive learning. (From publisher's description.)

Technology and Learning: Changing Minds in a Changing World
Southeastern Regional Council for Educational Improvement, 1985
P.O. Box 12746, 200 Park Offices, Suite 204, Research Triangle Park, NC
27709, 919/549-8216, $6.00 (Volume 4)

Fourth in a series on technology in education, this report explores the differences between the historically developed purposes, roles, and practices of schools; and the nature of the new technology. Summarizes the roles of technology in education, especially emphasizing that it is only teachers who can fully integrate the electronic technology. Intended to stimulate educators to create a suitable technological context in the schools of the future. Divided into three parts: The Changing Child; Effective Teaching in a Time of Change; and Change, a Process, Not an Event. Describes conclusions, arguments, observations, agenda, plus notes, and a bibliography. Also includes brief articles of topical interest.

"A Two Level Program for Training Teachers to Use Computers in the Classroom".
Carol Carrier, Allen Glenn, and Gregory Sales, *Educational Technology*,
October 1985, v.25, n.10, p.18.

Presents useful guidelines in training teachers to use computers. Suggests a two-level approach by dividing teachers into beginners and advanced. General enough to be adaptable to many teaching situations.

Using the Computer in the Classroom

Minnesota Educational Computing Corporation, 1983
3490 Lexington Ave. North, St. Paul, MN 55112, $19.00
(Versions available for Apple, IBM-PC, Commodore and Atari.)

This teacher training manual is designed to introduce educators to instructional computing on specific microcomputer systems. Focuses on practical knowledge to help educators become self-sufficient in classroom computing. Goals include operating a computer, exploring and selecting appropriate software, lesson plans, and an introduction to how computers are programmed. Also provides some technical "survival skills." This guide is divided into two sections: instructor notes and course materials which include everything needed to run a successful workshop. The course is divided into six sessions, each about two hours in length. The sessions include getting started, hardware and software, evaluating materials, planning lessons, curriculum and skills, computing and curriculum, and tools and utilities.

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4. SOFTWARE SELECTION

OVERVIEW

Effective uses of the computer depend to a great extent on software. The quality of educational software has improved markedly in the last few years and so has the availability of new titles. Identifying appropriate software from thousands of choices requires a well-organized software selection process. This chapter outlines major steps in a software selection process.

Software Selection Process

1. Define district goals, priorities, and policies

The software selection process begins with the broad goals and priorities laid out in the district technology plan (see Chapter One). The district technology plan should also include a policy statement on copyright. If it doesn't, see the resources on copyright at the end of this chapter, and prepare one.

2. Form a software selection committee

The district technology committee may have a software subcommittee that oversees the software selection process. Several task groups representing subject areas or grade levels may also be assigned to selecting software. Regardless of the organization, the software committee(s) should involve both the technology specialists or coordinators and the teachers using the software.

3. Identify general software needs

A list reporting the general type of software needed, target audience, and instructional goals can be prepared from the following:

- Needs Assessment: The results from surveys done for general program planning will have identified software needs.
- District Priorities: The district technology plan will have priorities that indicate software needs.
- Curriculum Goals and Objectives: Planning for computer curriculum will identify software needs for specific courses and subject areas.

4. Specify software to match needs (Include titles, hardware specifications, quantity to order, and costs.)

The following sources will help develop a list of potential titles: (Specific examples are listed in the resource section of this chapter)

- Catalogs: There are three kinds of catalogs:
    1. Catalogs from software producers contain all titles from one developer.
    2. Catalogs from software distributors contain titles from many producers.
    3. Catalogs from school supply houses often have sections of microcomputer courseware.
- Directories: Contain comprehensive listings of educational titles with brief descriptions.
- Journals or Magazines: Major educational computing periodicals contain fewer but lengthier descriptions of new titles. (See Chapter Eight for a list of educational computing periodicals.)

- On-Line Retrieval: On-line databases can be searched for titles and brief descriptions.
- Word of Mouth: This is a less conventional but highly used method for learning about software that works. Remember that the source has opinions based on individual needs and situations.

5. Research and refine the list of potential titles

Published software reviews or evaluations help to narrow the list of potential titles. As a word of caution, reviews are not intended for final purchase decisions; they help clarify the strengths and weaknesses of the software. Several publications listed in the resource section contain collections of reviews. Educational computing magazines also publish a few reviews each month.

6. Obtain software for preview

Software must be previewed before a final purchase decision. Even a very good program that earned high review marks may not really meet the objectives or match the audience of the situation it is planned for. Software suppliers offer a range of preview policies, so be sure to check the terms for the preview period. In many cases, the best you will get is 30 days to return a package for full refund.

Because preview is so essential in the selection process and because it is sometimes nearly impossible to get a preview copy, the following suggestions may help:

- It is advantageous to have a district-level software selection process which centralizes the requests for preview. Producers are less likely to grant a preview copy to individual teachers. Centralization also reduces the chance of multiple requests from a single district.
- The school district must support a strong copyright policy and communicate its existence with requests for preview. Many districts also establish a "no preview, no purchase" position and communicate it to producers with requests for preview, pressuring them to make preview copies available.
- Many producers provide preview only at selected preview sites. A state may have several preview sites, contact the State Department of Education for the nearest site. (State-by-state contacts are listed in Chapter Eight.)

7. Evaluate software for final recommendation

The complexity of the software evaluation phase will depend on the scope of the purchase. Small, individual purchases, for use by a limited number of teachers, will not require as much feedback as large purchases used by many. A formal evaluation procedure should address the following questions:

What criteria will be used?
Who will do the reviewing?
How many reviewers will be used?
What type of report will result?
What compensation/incentives will reviewers receive?
What are the procedures?
Who manages the process?
How and where will information be disseminated?

There are numerous software evaluation instruments; some are generic, designed for all educational software, and some are subject-specific. Existing instruments can be modified to suit a district's needs. Final evaluation reports should be collected and saved for others to use.

8. Final selection and purchase

Once the evaluation phase is over, make final recommendations and selection before purchase. At this point, a well-organized selection process may mean a good volume discount. Requests for educational discounts should be in writing, on school letterhead, and signed by someone with authority. It is difficult for individual teachers to negotiate a discount because they cannot guarantee volume or future purchases.

As the order is finalized, be sure to pay for the additional backup copy, if a backup must be purchased separately.

9. Catalog and maintain a software library

Once the software arrives, complete and return the registration form. This assures eligibility for support; this is especially true if upgraded versions are released.

As a software library grows, it will need to be cataloged, labeled, and maintained. Even if the software collection is dispersed and stored in individual classrooms, procedures for recordkeeping and checkout should be prepared. Many districts manage a software library with similar methods as those used with books. For example:

- The software is described and indexed with records stored in a card catalog or an electronic database.
- The software is labeled with a call number and shelved.
- There are procedures for using and returning the software.

10. Follow-up

The final phase of software selection involves gathering teacher reactions and suggestions after the software has been in use for some time. Even in a careful selection process, mistakes are made. Certain software may not work or, it may be quite useful. It is important to document this information and make it available to other schools or teachers. In some districts teacher-user groups or clubs become a forum for sharing software suggestions and classroom activities.

CHECKLIST

Software Selection

Notes

_________ 1. Define district goals, priorities, and policies
  - Broad goals and priorities
  - Copyright policy

_________ 2. Form a software selection committee
  - Technology specialists
  - Subject-area or grade-level teachers
  - Outline tasks and timelines

_________ 3. Identify general software needs
  - Results from needs assessment
  - District priorities
  - Curriculum goals and objectives

_________ 4. Specify software to match needs
  - Titles
  - Hardware specifications
  - Quantity to order
  - Cost

_________ 5. Refine list of software
  - Use available reviews and evaluation data

_________ 6. Obtain software for preview
  - Centralize preview requests
  - Observe preview deadlines

_________ 7. Evaluate software for final recommendation
  - Prepare evaluation procedure
  - Choose software evaluation instrument
  - Collect and analyze final reports

Software Selection (cont.)

Notes

_________ 8. Final selection and purchase

- Choose software for purchase
- Obtain discounts
    - educational
    - volume order
    - multiple copies or lab packs
- Purchase backups (if necessary)

_________ 9. Catalog and maintain a software library

- Complete and return registration form
- Catalog software
    - call numbers
    - description
- Index software
    - by title
    - by subject and/or curriculum area
    - by hardware and/or producer
- Label and shelve software
- Develop check-out procedures

_________ 10. Follow-Up

- Collect teacher reactions after software has been used

RESOURCES

Software Selection

"Have It Your Way: How Software Publishers Respond to Your Needs."
Judy Salpeter, *Classroom Computer Learning*, January 1988, v.8, n.4, p.34.

Fifty-one software publishers respond to educators' software concerns, including: lab packs, site licensing, quantity discounts, multiple loading, network compatibility, disk format, copy protection, backups and previews. Article provides chart of publisher policies as well as general discussion.

Selecting and Implementing Educational Software
Sam Miller, 1987
Allyn and Bacon, Seven Wells Avenue, Newton, MA 02159, $24.95

An introductory text for training teachers in evaluating, selecting, and using educational software. Includes discussion of types of educational software, a process for locating software, previewing and reviewing software, and organizing software for classroom use. Each of the five chapters concludes with a useful annotated list of readings and resources.

Software Selection, Evaluation, and Organization
International Council for Computers in Education
University of Oregon, 1787 Agate Street, Eugene, OR 97403, $16.00

This packet of materials for workshops includes two booklets *The Educational Software Preview Guide* and *Evaluator's Guide for Microcomputer-Based Instructional Packages*, 12 relevant article reprints from *The Computer Teacher* and the *SIG Bulletin*, 39 selected reviews of highly-rated software, and a sample issue of *The Computing Teacher* Journal.

Software Copyright

"As New Technology Booms, What is 'Fair Use' of Educational Software?"
Daniel Brooks, *NASSP Bulletin*, February 1984, v.68, n.469, p.66.

An attorney, specializing in computer law, reviews the basics of the new copyright act, discusses computer uses of copyrighted work and the fair use doctrine as it applies to software. Cites sections of the law with interpretations and gives some practical advice.

"ICCE Policy Statement on Network and Multiple Machine Software."
The Computing Teacher, September 1983, v.11, n.1, p.18.

This document, prepared by an ICCE committee on copyright, lists responsibilities of educators, hardware vendors, and software developers/vendors. Includes two suggested policy statements: one for a school district and one for a community college; a suggested format for software licenses and technical notes on software encryption.

"ICCE Publishes Statement on Software Copyright Violations."
Editors, *Electronic Learning*, October 1983, v.3, n.2, p.22.

Reviews an eight-page document "ICCE Policy Statement on Network and Multiple Machine Software" written to assist educators, publishers and vendors in understanding the problem of software piracy. Included is a handy sample form letter describing a school district's policies which could be sent to publishers.

"Should I Copy Microsoftware?"
International Communications Industries Association (ICIA),
3150 Spring Street, Fairfax, VA 22031, 703/273-7200, Free

A brochure to help schools adopt copyright policies. Topics include copyright laws, views of educators and producers, how to avoid copying, and where to get more information. There is also a list of eleven do's and don'ts.

"Software Copyright Interpretation."
LeRoy Finkel, *The Computing Teacher*, March 1985, v.12, n.6, p.10.

Discusses current interpretation of copyright laws including backup copies, multiple-loading of one disk into many machines at the same time, and networks. While the laws are often vague, this article looks at how the laws are likely to be interpreted.

Software Quality and Copyright

Association for Educational Communications and Technology
1126 16th N.W., Washington, DC 20036, $16.00
ED 249 934 (See page 13, Chapter 1 for ordering ERIC documents.)

Examines instructional software quality and problems of copyright violation. Explains copyright laws, how to use software legally as well as addresses ethical issues. Appendices include a recommended policy statement and guidelines on multiple machine software and copying, a 30-item reference list, glossary and sample licensing agreement.

Thou Shalt Not Dupe

The Computer Software Services Industry Association (ADAPSO)
1300 N. Seventeenth Street, Suite 300, Arlington, VA 22209, 703/522-5055,
Free (Requests for more than five copies are $0.75 each.)

This booklet provides an overview of the U.S. Copyright Law as it pertains to computer software. It is designed to increase public awareness that software duplication is illegal and it hurts purchasers as well as developers. Included is a suggested policy statement on illegal copying.

"Untangling the Copyright Issues."

Christopher Williams, et al., *Electronic Learning*, Nov/Dec 1985, v.5, n.3, p.46.

Summarizes 39 major software publishers' current software copyright policies. Includes which publishers allow use with a network, loading with a hard disk, making backups, multiple-loading programs and so forth.

Identifying Software

Directories

Apple Curriculum Software Guides

Apple Computer, Inc., P.O. Box 1834, Escondido, CA 92925, $23.00 each.

Describes software that has been favorably reviewed by major reviewing agencies or screened by teachers. Each title is mapped on a curriculum skills matrix that contains objectives, concepts/content, and processes/applications. Six guides that cover four subjects are available: K-12 science; K-6 and 6-12 math; K-6 and 6-12 reading, writing, and language arts; and K-12 social studies. (These guides are also available from Apple education dealers and sales representatives.)

ATMI Courseware Directory

Association for Technology in Music, 1987
Dr. Charles G. Boody, Evaluation Center, 1001 Highway 7, Hopkins, MN 55343, $10.00

Contains complete list of music instruction software with very brief descriptive information, extended descriptions of 52 titles, list of music hardware, and a brief list of journals and other print materials of interest.

The Educational Software Selection (TESS) 1986-87

EPIE Institute, P.O. Box 839, Water Mill, NY 11976, 516/283-4922, $59.95

The most comprehensive print source for descriptive information and brief evaluation ratings of over 8000 educational and software titles. Includes addresses and purchase policies of distributors and producers.

The Educational Software Selector (TESS) 1988 Supplement

EPIE Institute, P.O. Box 839, Water Mill, NY 11976, 516/283-4922, $32.95

Contains descriptions of over 3000 new or highly-rated educational software titles in the same format as the '86-87 edition.

Software for Schools 1987-88: A Comprehensive Directory of Educational Software, Grades Pre K-12

Describes nearly 8000 educational software titles. Includes selected articles, sources for software reviews, checklists for hardware and software selection, and a glossary of computer terms.

1987 Survey of Early Childhood Software

High/Scope Press, 600 N. River Street, Ypsilanti, MI 48198, $20.00

Describes and gives detailed ratings of nearly 150 software packages designed for preschool and kindergarten-aged children.

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Databases

EPIE On-Line

Produced by Educational Products Information Exchange
Vendor: CompuServe, 5000 Arlington Centre Boulevard, P.O. 20212, Columbus, OH 43220, 800/848-8990

Includes software listings and brief descriptions, critical reviews of selected titles, and an electronic bulletin board for educators.

International Software Databases

Produced by Imprint Software Ltd.
Vendor: DIALOG; DIALOG/Knowledge Index, 3460 Hillview Ave., Palo Alto, CA 94303, 415/858-3785

Contains software listings and descriptions: educational and others, national and international.

Resources in Computer Education (RICE)

Northwest Regional Educational Laboratory
Technology Program, 101 S.W. Main, Suite 500, Portland, OR 97204, 503/275-9628, $15.00 per search

Contains evaluative and descriptive information on nearly 4000 educational software titles and information on about 1200 educational software producers. Search requests are made by phone or mail and results are returned within a week. Search forms are available from the above address.

Specialware Database

LINC Resources Inc., Publications Division, 91 Vine Street, Pawtucket, RI 02861, 401/725-3973, $175.00 complete database or $10.00-$30.00 for subsets

Contains nearly 800 descriptions of software for special education. Entire database can be purchased for MS-DOS or Apple II computers.

Texas Education Computer Cooperative Database (TECC)

Produced by Texas Education Computer Cooperative
Vendor: BRS Information Technologies, 1200 Route 7, Latham, NY 12110, 518/783-1161

Contains evaluations of educational software by teachers and students.

Review and Evaluation Sources

Published Reviews

Administrative Software for Schools
Administrative Software Clearinghouse
Memphis State University, Room 101, Memphis, TN 38152, 901/454-2368, $4.65

Describes 76 administrative programs that were rated good or excellent.

CHIME Newsletter
Oklahoma State University, 108 Gunderson, Stillwater, OK 74078-0146, $15.00/year (6 issues)

This newsletter of the Clearinghouse of Information on Microcomputers in Education publishes 10-15 in-depth software reviews each issue.

Computer Courseware Evaluations
Alberta Education, Learning Resources Distribution Center, 12360-142 Street, Edmonton, Alberta, CANADA T5L 4X9, $3.00 for current volume

A collection of about 100 educational software reviews per volume. Each title has been screened for appropriateness and then evaluated by three teachers. Seven volumes spanning September 1983 to December 1987 have been published.

MicroSIFT Quarterly Reports
Northwest Regional Educational Laboratory
Office of Marketing, 101 S.W. Main, Suite 500, Portland, OR 97204, 503/275-9515, $3.00-$10.00 per report

The federally funded MicroSIFT Project prepares reports on software by curriculum area or topic. Reports include comparative charts and brief descriptions. About ten products are highlighted in each report with special commentary about their strengths. Recent report topics include: computer aided drafting, function plotters for mathematics, AIDS and drug education, and word processors for elementary students.

The 1988/89 Educational Software Preview Guide
International Council for Computers in Education (ICCE)
University of Oregon, 1787 Agate Street, Eugene, OR 97403, 503/686-4414, $10.50 prepaid

This annual publication lists educational software favorably reviewed by more than one reviewing agency. Includes title, descriptive sentence, mode, grade level, and price. It is intended to be an aid in locating software for preview, not a buying guide.

Only the Best: The Discriminating Software Guide for Preschool-Grade 12 (1987-88 Edition)

Education News Service, P.O. Box 1789, Carmichael, CA 95609, $21.95

Editors review thousands of evaluations and take "only the best"--those that receive excellent ratings by two software reviewing agencies and have no negative ratings. This edition summarizes 146 educational programs that had been reviewed by 30 evaluation agencies.

Software Reports

Trade Service Corporation, 10996 Torreyana Road, San Diego, CA 02121, 800/542-6421, $149.50/year

Over 600 reviews per year are available in two formats: looseleaf with biweekly updates and two seasonal (fall and spring) directories. Reviewed by volunteer teachers and given letter grades, those that do not get at least a "C" are not included.

Technology in the Curriculum

California State Department of Education, 1987
Publication Sales, P.O. Box 271, Sacramento, CA 95802-0271, $150.00 for entire set

Describes computer software and instructional video that has been rated desirable or exemplary by teachers. Each is mapped against the California state curriculum frameworks. Six guides cover mathematics, science, history-social science, language arts, foreign language, and visual and performing arts. Each guide is accompanied by a database and database management program. Four 1987 updates have been prepared and are also available.

Articles: Software Review

"Creating a Software Review Collection."

Glenn Fisher, *The Computing Teacher*, February 1985, v.12, n.5, p.22.

Presents a practical way of organizing software reviews from many sources. Includes how the collection is categorized and specifics on the actual work involved.

"Educational Software Reviews: Where Are They?"

Steven Brown, et al., *The Computing Teacher*, August/September 1984, v.12, n.1, p.33.

Identifies forty-two current sources of software reviews and defines terms commonly used to describe types of software.

"Finding Helpful Software Reviews"

Ted Kruse, *Classroom Computer Learning*, December 1987, v.8, n.3, p. 44.

Describes seven software review services that are easily accessible and relatively low priced.

Previewing Software

"Criteria for Identification of Software Resource Centers: An ICCE Policy Statement"
ICCE Software Resource Center Committee, *The Computing Teacher*, October 1987, v.15, n.3, p. 14.

Offers guidelines for teachers and software publishers as to what constitutes a software preview center. Lists responsibilities of: (1) the software resource center, (2) the software publisher, and (3) the schools.

Directory of Software Preview Centers
International Communications Industries Association (ICIA), Second Edition
3150 Spring Street, Fairfax, VA 22031-2399, 703/273-7200,
$25.00 prepaid orders only

This comprehensive directory of over 400 preview centers listed by state, is designed primarily for software publishers.

"EL's National Directory of Software Preview Centers."
Electronic Learning, January 1984, v.3, n.4, p.59.

Lists regional preview centers where educators may preview large inventories of software. This is Part I which covers states west of the Mississippi. Part II may be found in the February 1984 issue, v.3, n.5, p.42.

"Mail-Order Software Distributors with Liberal On-Approval Policies".
Ann Lathrop and Janice Marshall, *The Computing Teacher*, June 1985, v.12, n.9, p.31.

Lists 13 mail-order distributors who accept on-approval orders. Includes refund policies, shipping and handling charges, and programs where the publisher is identified.

Software Evaluation

Evaluation Guides

Evaluation of Educational Software: A Guide to Guides
Northeast Regional Exchange, 1983
101 Mill Creek Road, Chelmsford, MA 01924, 617/256-3985, $6.00

A resource book designed to help educators choose an evaluation procedure. Ten national software evaluation forms and examples of completed evaluations plus an article on how to evaluate an evaluation comprise the content of the book. An extensive list of resources including books, directories, articles, periodicals, reports, clearinghouses and databases is included.

Evaluator's Guide for Microcomputer-Based Instructional Packages
Northwest Regional Educational Laboratory, July 1984
International Council for Computers in Education (ICCE), University of Oregon, 1787 Agate Street, Eugene, OR 97403, $3.00

This guide explains the MicroSIFT (Microcomputer Software Information for Teachers) evaluation process and defines terms used on the form, as well as sample reviews. MicroSIFT evaluations are available on the RICE database as well as in print. (MicroSIFT software description and evaluation forms are included at the end of this chapter.)

Guidelines for Evaluation of Computerized Instructional Materials
National Council of Teachers of Mathematics, 1984
1906 Association Drive, Reston, VA 22091, $3.00

This booklet is a practical aid to both users and developers of all courseware. A position statement by the National Council of Teachers of Mathematics is followed by chapters including: obtaining software and hardware, guidelines for software review and documentation, information for programmers, suggestions for future planning, sample evaluation forms, and a bibliography.

Evaluation Articles

"Behavioral Learning Theory-Based Computer Courseware Evaluation."
Eleanor Criswell and Robert Swezey, *Educational Technology*, November 1984, v.24, n.11, p.43.

Argues for courseware evaluation based on learning theory. Briefly reviews principles of learning and provides an evaluation checklist which measures these principles.

"The DISC Model for Software Evaluation and Support Material Design".
Shelley York Rose and Carol Klenow, *The Computing Teacher*, August 1983, v.1, n.1, p.32.

Reviews the DISC (Documentation and Integration of Software into the Classroom) Project and the training of a network of 100 educators in its application. Using an adapted version of the MicroSIFT evaluation form and then using the DISC Model, evaluators designed support material components. Includes implementation costs.

"Educational Software: The Evaluation Process."
Robert Molek and Dennis Switzer, *AEDS Monitor*, May/June 1984, v.22, n.11-12, p.20.

A college has developed an evaluation process and instrument. This evaluation is divided in two parts: a technical evaluation checklist and a set of questions to evaluate instructional characteristics.

"Formative Evaluation of Courseware: One Instrument."
Cheryll Duquette, *Educational Technology*, February 1985, v.25, n.2, p.20.

Details a three-page courseware evaluation instrument for software developers. It is based on evaluation literature and includes eight topics: objectives and pretesting, content, questions, posttest, technical, workbook, instructional supervisor, and general.

"Guidelines for Evaluation of Computer Software (with an Evaluation Form)."
Wayne Fetter, *Educational Technology*, March 1984, v.24, n.3, p.19.

Describes a two-page evaluation form developed and used by a college. Includes topic explanations.

"Guidelines for Review and Evaluation of English Language Arts Software"
Committee on Instructional Technology, 1984
National Council of Teachers of English
1111 Kenyon Road, Urbana, IL 61801, 217/328-3870
Free single copies.

A two-page software evaluation instrument, adaptable for any educational software. Emphasizes teacher and student evaluation of software. Describes a five-step process for software evaluation.

"A High School Evaluates Software (with an Evaluation Form)."
Dwain Thomas, *Educational Technology*, September 1984, v.24, n.9, p.21.

Reviews and includes a software evaluation form designed by Lake Park High School in Roselle, Illinois. Sets up guidelines which might work for any school district.

"How Do Teacher and Student Evaluations of CAI Software Compare?"
Barbara Signer, *The Computing Teacher*, October 1983, v.11, n.3, p.34.

Presents teacher and student questionnaires to evaluate software, descriptions of the instruments, results and limitations gathered during this computer assisted instruction research grant.

"Social Studies Microcomputer Courseware Evaluation Guidelines."
Stephen Rose, et al., *Social Education*, November/December 1984, v.48, n.7, p.573.

Describes software evaluation guidelines and a form prepared by the National Council for the Social Studies. The two-stage evaluation process focuses on the courseware's relationship to social studies goals and on technical/instructional issues. The evaluation form is divided into three categories: knowledge, skills, and values.

Managing a Software Collection

"North Carolina: A Software Evaluation Plan with National Implications."
Cheryl Mead, *Electronic Learning*, October 1983, v.3, n.2, p.32.

Presents the Media Evaluation Services (MES) courseware cataloging process which implements a familiar library system. Guidelines include: finding the call number, setting up the catalog card, processing courseware, documentation, and containers and packaging.

"Software Organization."
Leon Roland, *The Computing Teacher,* March 1985, v.12, n.6, p.39.

Explains three ways software collections may be accessed. Includes detailed descriptions of three basic organizational steps: data collection, data storage, and data retrieval. Includes sample entries. (Author's program for making bibliographies is available to ICCE members for $5.00.)

CMC News (three issues/year)
Computers and the Media Center
515 Oak Street North, Cannon Falls, MN 55009, $5.00 Prepaid

A forum for the exchange of news and ideas on the application of microcomputers in library and media programs. Editor maintains a database of commercial software for library applications.

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5. HARDWARE SELECTION

OVERVIEW

Hardware selection should follow a process that begins with the broad goals of the district technology plan and follows the decisions made during the software selection process. This chapter gives an overview of the hardware selection process after describing several hardware-related considerations that are of concern in the selection process.

Computer Features

Memory. The machine memory necessary to execute a program will depend on the software. When purchasing hardware, it is advisable to buy the maximum possible memory. Most current software requires 64-128K of memory.

Data Storage. Data storage devices include disk drives using floppy disks or hard disks. Instructional programs may need only one disk drive for floppy disks, although some require or may operate more conveniently with two. Hard disk storage is more expensive and not generally necessary for instructional uses of microcomputers. Hard disks are most likely used as storage for a networked system of computers. (See Networks.)

Languages. If programming is a priority for microcomputer use, it is important to examine the availability and cost of implementing various languages. Languages of interest include BASIC, Pascal, Logo, authoring languages, FORTRAN, COBOL.

Disk Operating System (DOS). The disk operating system is software that allows the computer to communicate with the disk drive. Some computer systems require that DOS be purchased separately.

Screen Display.

- Monitors—Monochrome monitors are typically green or amber. Color monitors are more expensive but certain applications, especially at the elementary level, are more effective in color. Some systems require purchasing an additional monitor interface card. A large color monitor is desirable for demonstration purposes.
- Display width—The ability to display 80 columns of characters across the screen is important, especially for certain applications like word processing and spreadsheet analysis.

Keyboard. Keyboards that resemble a typewriter in layout, in key shape, and in touch are considered the best for classroom use. Other keyboard features include:

- Size—It should be appropriate for the motor skills of the students using it.
- Numeric pad—This additional calculator-style keyboard is included with many systems but is generally not necessary for instructional purposes.
- Function keys—Special function keys that perform a specific action are not necessary but included with some computer systems.

Sound. Instructional applications of computers use sound in various ways. Some hardware considerations that relate to sound include:

- Volume—Often sound is controlled by the software using sound, but some computer systems also have volume control as part of the hardware.
- Headphone outlet—Headphones are useful in classrooms; students can experience the audio portion of a program without disturbing others.

- Voices—Computers may have several separately programmed "voices" or audio outputs. The greater the number of voices, the more complex the sound output. The number of voices is probably a concern only in programming classes or music applications.

Expandability. The number of extras that can be added on to a system is determined by internal expansion slots or external plug-ins. It is useful to have the option to add peripherals and capabilities as the technology program grows and changes.

Compatibility. It is possible to buy alternative computer systems that are compatible with or able to run software for major brands and models of computers. While these systems are less expensive, the level of compatibility is a concern. It is wise to try the software that will be used on the system and test its compatibility. It is also possible to buy expansion boards or cards to add to one system and make it run the software designed for a different system.

Portability. Computer systems that are portable enough to be moved from one place to the next are a consideration in school settings. Portability makes overnight checkout for teachers, students, and parents a possibility.

Reputation and Software Support. Computer systems have varying reputations for level of educational support and appropriateness in educational settings. They also have different amounts of compatible educational software available. Both of these should be considered during hardware selection.

Cost. Cost is, of course, a consideration in hardware selection, but should not be the final word in decisions.

Warranty. The industry standard for warranties is ninety days from the date of installation. Any major manufacturing flaws or problems typically appear within this time.

Maintenance and Service. A good maintenance contract will guarantee a short turnaround time or provide loaner equipment in the event of hardware breakdown.

Peripherals

Printers. Printers are the most common "extra" purchased for a computer system. It is not necessary to buy one for each computer station but for applications like word processing or programming, a printer for every 2-4 computers may be necessary. Printer switches allow several computers to "take turns" with the computer. There are several types of printers:

- Dot matrix—This is the most common printer used in educational settings. The dot matrix offers speed, a variety of type styles, and low cost. When coupled with a graphics adapter card or a screen dump program, the dot matrix can print images.
- Letter quality—The print type from a letter–quality printer is comparable to that of a typewriter. However, it is slow and costs two-three times as much as a dot matrix printer.
- Ink jet—The ink jet produces a dot matrix type of print, provides a variety of type styles, is fast and quiet, and may produce multicolored printouts. The ink jet is a little more expensive than the dot matrix.
- Laser—This state-of-the-art printer, while more expensive, is quiet, fast, and produces letter-quality print and picture-perfect images.

Plotters. Plotters are specialized printers capable of drawing lines. They are used to produce graphs, charts, schematic diagrams, blue prints, etc. and they often have color capability. (See Computer Aided Design, next section).

Graphics Tablets. Graphics tablets are used to input images with lines and color. They give detailed control over the images. They are of use in art, drafting, and interior design classes. (See Computer Aided Design, next section.)

Speech Devices. Speech devices produce speech from input. They are often used in conjunction with software for early grades, special education, or foreign language study.

Additional Capabilities

Telecommunications. Telecommunication capability connects the school computer(s) to other computers via the phone lines. This puts a school in touch with large databases, information utilities such as The Source or CompuServe, or with other schools through electronic mail or bulletin board services.

Telecommunication requires a modem and some kind of interface, typically an RS232 serial card or communications port. Some microcomputers have the modem and communications port built in.

Computer Aided Design (CAD). Computer Aided Design or CAD systems often combine peripherals like plotters and graphics tablets with graphics software. A CAD system supports design and drafting in two and maybe three dimensions. Vocational and industrial education programs use CAD systems.

Interactive Video. Interactive video combines the electronic control of a computer with the visual display of video. The video portion can come from videotape or videodisc. Either technology requires an interface between the computer and the corresponding player. Because videodisc technology has certain advantages, it is the more exciting video alternative and the most publicized. Not only can a videodisc store a tremendous amount of video (and digital data), segments or frames can be found extremely quickly.

CD-ROM. CD-ROM or Compact Digital Read Only Memory is a new high density data storage method that provides easy access to large amounts of information. CD-ROM uses the same small (4-3/4") optical disk of the music recording industry and a disk drive that converts optical images into computer compatible data.

Networks. There are advantages to linking several computers in a short-range communications path or Local Area Network (LAN). As part of a network, computers share peripherals and data storage devices so that hardware purchases and costs are reduced. A network system means more centralized control of software and more control over what students are doing at each work station. While networks have improved a lot recently, installation and maintenance are complicated and costly. Also, special network versions of educational software must be purchased if it is available.

Hardware Selection Process

1. Review previous plans and decisions on the following:

- District goals, priorities, and implementation guidelines
- Computer curriculum and instructional computer uses
- Software selection

Plans and decisions made previously will guide the hardware selection process. For example, a district decides that, as a priority, microcomputers will be used for improvement in basic skills at the upper elementary grades; it also decides that keyboarding instruction will begin at the third grade. For the basic skills program, software providing a comprehensive curriculum with management is chosen but it runs only on a certain kind of computer. The software chosen for keyboarding is only effective in color. Both curriculum decisions affect software selection, which in turn affects hardware selection.

2. Form a hardware selection committee

The committee should involve a variety of personnel, technology specialists, teachers, and administrators.

3. Develop a set of prioritized specifications to match district plans

With the help of the hardware considerations outlined in the first part of this chapter, develop a list of preferred computer features, peripherals, and additional capabilities. Establish priorities for the features with a weight factor for relative importance.

4. Collect information on available hardware

There are several sources for learning about available hardware:

- Literature—This includes: catalogs from vendors, manufacturers, and distributors; and hardware review articles from periodicals.
- Existing installations—Visit other school districts or business in the community with computer installations.
- Computer vendors—Establish a relationship with local vendors carrying major brands of computers. In the long run, purchases from local vendors are useful because ongoing service and support is more convenient.
- Local user groups—There are user groups for specific hardware brands in many larger communities. Information on a particular brand may be available through them.

5. Compare, evaluate, and summarize the features of available hardware

This step parallels step three because information gathering may also involve "test driving" computer hardware. The hardware evaluation process should be guided by an evaluation instrument. There are existing hardware evaluation forms or one can be prepared using the list of hardware characteristics at the beginning of this chapter.

6. Make recommendations on the brands and numbers of computers to purchase

The results of step five should lead to final decisions on the brands and models of computers to purchase. Budget limitations aside, there are no absolutes for determining how many computers are enough for your plans. Some districts set student-to-computer ratios for various grade levels and buy enough computers to obtain that ratio. Others estimate purchase quantity with a formula based on student hands-on time:

$$\text{Number of Computers} = \frac{\text{Number of Students x Minutes with Computer/Day}}{\text{360 Minutes in a Day}}$$

$$\text{An example: } \frac{\text{125 Students x 30 Minutes/Day}}{\text{360 Minutes}} = \text{10-11 Computers}$$

7. Follow district purchase and bid policies and finalize hardware purchases

If the district policies require, prepare bid specifications and solicit bids, or, develop a sales contract with a selected vendor. In either case, be sure to include delivery, installation, service, and maintenance provisions.

CHECKLIST

Hardware Considerations

Notes

_________ 1. Computer Features

- Compatibility with selected software
- Memory
- Data Storage
  - Disk drives
  - Hard disks
- Languages
  - BASIC
  - Pascal
  - Logo
  - Authoring Languages
  - FORTRAN
  - COBOL
- Disk Operating System (DOS)
- Monitor
  - Monochrome
  - Color
  - Large Screen
- Screen Display
  - 80 Column
- Keyboard
  - Size and Touch/Feel
  - Numeric Pad
  - Function Keys
- Sound
  - Volume control
  - Headphone outlets
  - Number of voices
- Expandability
- Compatibility
- Portability

Notes

Hardware Considerations (cont.)

- Warranty
- Maintenance and Service

__________ 2. Peripherals

- Printers
  - Dot matrix
  - Letter quality
  - Ink jet
  - Laser
- Plotters
- Graphics Tablets
- Speech Devices
- Additional Input Devices
  - Joysticks
  - Game paddles
  - Light pens

__________ 3. Additional Capabilities

- Telecommunications
  - RS232 card/communications port
  - Modem
- Computer Aided Design (CAD)
- Interactive Video
  - Videodisc player
  - Computer/videodisc interface
- CD-ROM
- Networking
  - Network server
  - Hard disk
  - Network software
  - Cables

Hardware Selection Process

Notes

_________ 1. Review previous plans and decisions on:

- District goals, priorities, and implementation timelines
- Computer curriculum and instructional uses of computers
- Software selection

_________ 2. Form a hardware selection committee

- Administrators
- Teachers
- Technology specialists

_________ 3. Develop hardware specifications to match plans. Include:

- Hardware considerations listed in Part I
- Preferred features
- Peripherals
- Additional capabilities
- Relative priority or weight factor

_________ 4. Collect information on available hardware. Use:

- Literature
- Existing installations
- Computer vendors
- Local user groups

_________ 5. Compare, evaluate, and summarize available hardware features

- Develop/use hardware evaluation form
- "Test-drive" hardware systems

_________ 6. Make recommendations

- Choose brands, models, etc.
- Quantity of each
- Combine all purchases into single, large purchase

Hardware Selection Process (cont.)

Notes

_________ 7. Finalize hardware purchase

- Follow district purchase and bid practices
- Prepare bid specifications
- Prepare sales agreement or contract
- Include delivery and installation provisions, and service and maintenance contract

RESOURCES

General Hardware Selection

"Adding a Micro to Your School Picture."
Karen Billings and Stephen Gass, *Electronic Learning*,
January/February 1982, v.1, n.4, p.35.

Presents a five-step process for selecting a microcomputer. Describes 12 factors including options and reasons to consider. Offers a helpful factor weight chart for microcomputer evaluation.

"The Hardware Game: Sorting the Winner from the Losers."
Odvard Egil Dyril, *Classroom Computer Learning*,
April/May 1984, v.4, n.9, p.54.

Asks a series of questions educators may use to ensure efficient long-term computer purchases. Addresses these questions while summarizing recent educational developments of ten hardware companies.

"The Bid Process: How to Tell Vendors Exactly What You Want."
Leroy Finkel, *Electronic Learning*, March/April 1982,
v.1, n.6, p.22.

An older but not dated article that lists fourteen bid specifications that should be included in a set of specifications for a hardware purchase. Also includes concerns of computer vendors when dealing with the educational market.

"Tracking Down the 'Right' Computer".
Electronic Learning, January 1984, v.3, n.4, p.39.

Defines the 'right' computer as the one which best suits an individual or school's need. The key to selection is finding the most appropriate software and then the hardware on which to run it. Describes ten objectives, including the common, as well as 'real-world' applications; teaching art and music; special education needs; administrative functions and library management. Offers practical guidelines by the EL's Board of Advisors. Includes a detailed comparison chart of twelve educational computers.

Printers

"Active Printer Market Lowers Prices as the Technology Advances."
Evan Birkhead, *T.H.E. Journal*, January 1986, v.13, n.5, p.12.

Discusses current printer market in education. Points out the varying printer needs of a school: administrative and instructional. Educators consider these issues when purchasing a printer: price, compatibility, durability, and speed. Describes specific printers for education with manufacturer, model, price, recommended for classroom or administrative use, print characteristics, speed, buffer, interface, and compatibility.

"Laser Printers"
Heather-Jo Tafemer, *Personal Computing*, August 1987, v.11, n.8, p.121.

Gives a short overview of purchase considerations and compares over 80 laser printers in a chart of features.

"Laser Printers: Exotic Graphics and Other Eye-Catching Output for Under $3,000"
Jerry Olivas, *Classroom Computer Learning*, December 1987, v.8, n.3, p. 49.

Describes advantages and disadvantages of laser printers, provides a short set of questions to ask before purchasing, and includes a chart comparing 18 laser printers that cost under $3,000.

"Laser Printers Are Quiet and Fast, But They Do Have Limitations"
Larry Pogue, *Electronic Learning*, March 1988, v.7, n.6, p.34.

Describes how a laser printer works and lists purchasing tips before comparing 14 laser printers that cost under $3,000 and 11 that cost between $3,000 and $5,000.

Monitors

"High-Resolution VGA Monitors."
Charles Bermant and Patrick Honan, *Personal Computing*, May 1988, v.12, n.5, p. 158

A buyer's guide that features the newest standard in high resolution video, Video Graphics Array (VGA). After describing the implications of the new standard introduced in IBM's PS/2 line, nine VGA monitors are compared and ranked.

"Monitors."
Christopher O'Malley, *Personal Computing*, June 1985, v.6, n.9, p.223.

A buyer's guide to evaluating computer monitors. Contains factors to consider; monochrome vs. color; a glossary of video terms; and a complete guide to almost 200 monitors including price, screen size, resolution, and special features.

"Seeing the Big Picture with the New LCD Screens"
Jerry Olivas, *Classroom Computer Learning*, October 1987, v.8, n.2, p. 32.

Describes LCD projection systems that use an overhead projector to give inexpensive, classroom-sized viewing inexpensively. Includes buyer's tips, limitations of the technology and a chart comparing eight models.

"What to Look for in a Monitor."
Consumer Reports, July 1985, v.50, n.7, p.420.

Compares monochrome, color, RGB and color composite monitors; also monitor/receivers. Contains a detailed chart.

Modems and Telecommunications

"Hello Out There."

Candy Colburn, *Teachers and Computers*, October 1987, v.5, n.2, p. 25.

Gives nine steps for getting started in telecommunications, ideas for helping kids go online, purchasing suggestions for modems and telecommunications software, and references for more information.

"Modem Magic."

Russ Lockwood, *Creative Computing*, May 1985, v.11, n.5, p.14.

Comprehensive explanation of the modem, a peripheral used in telecommunications. History, speed, types, software, and telecommunications costs are among the topics. Includes a glossary of terms, a list of popular telecommunication services, and a modem comparison chart listing 70 manufacturers, price, speed, etc.

Special Issue—Telecommunications

The Computing Teacher, April 1987, v.14, n.7
International Council for Computers in Education,
University of Oregon, 1787 Agate Street, Eugene, OR 97403

Contains 12 articles that help educators get started in telecommunications and describe classroom projects using telecommunications.

Telecommunications Planning Guide

McGraw-Hill, Inc., 1988
MIX, 9855 W. 78th Street, Eden Prairie, MN 55344,
800/622-6310, Free

This eight-page booklet describes the essential components for telecommunications, compares seven information services with features of interest to educators, and includes a useful telecommunications budget worksheet.

Interactive Video/Videodisc

"Buyer's Guide - Videodisc Hardware."
Frank Lovece, *Electronic Learning*, April 1984, v.3, n.7, p.60.

Presents a summary of available video interface devices and laser videodisc players. Describes how each works and how a videodisc player and an interface device are hooked up. Contains a list of fifteen manufacturers' various devices.

"CD-ROMs and Laser Discs—Now is the Time to Prepare."
Richard Alan Smith, *SIG Bulletin*, July/August 1985, v.2, n.1, p.17.

Describes how CD-ROMs and laser videodiscs are highly efficient storage media and will soon be cost-effective. Lists advantages and guidelines for computer coordinators to use in developing plans for their use. Includes appendices listing periodicals, producers and distributors of laser videodiscs, and companies developing CD-ROM products.

"How They're Using Interactive Videodiscs."
Fran Reinhold, *Electronic Learning*, April 1984, v.3, n.7, p.56.

Describes a project in which 45 schools were set up with videodiscs, authoring systems, and technical assistance. Difficulties included the shortage of educational discs and the logistics of setting up. Reports on three schools who continued use once the project was completed and three universities who are producing interactive videodiscs.

"Interactive Video: Easier Than You Think."
Robert Martin, *The Computing Teacher*, December 1987, v.15, n.4, p. 39.

Describes author's use of an authoring system to repurpose videotapes to create individualized, self-paced, interactive lessons. A sidebar piece describes the software and hardware he uses and excerpts a copyright option on frame-coding a videotape.

Interactive Video in Special and General Education:
A Development Manual
Gary Nave and Patti Zembrosky-Barkin
International Council for Computers in Education (ICCE)
University of Oregon, 1787 Agate Street,
Eugene, Oregon 97403, 503/686-4414, $16.00

A resource book for both special and general education audiences, this is an introduction of interactive video instruction or computer assisted video instruction (CAVI). Topics include: instructional design, video production, computer programming, and curriculum finalization. While specific examples are from special education, this procedure may be applied to any educational content. Delivery systems and educational application areas are also discussed. (Publisher's description.)

"The Interactive Videodisc Here at Last."
Jim St. Lawrence, *Electronic Learning*, April 1984, v.3, n.7, p.49.

Comprehensive report on videodiscs including practical articles on interactivity, repurposing (adding more interactivity to a noninteractive videodisc) and classroom applications. Also contains a guide to 33 educational videodiscs in eleven subject areas describing content, price, running time, and vendor.

"Interactive Video: Fifty-One Places to Start—An Annotated Bibliography."
Doris Brodeur, *Educational Technology*, May 1985, v.25, n.5, p.42.

Fifty-one references to articles from various publications. Includes articles on hardware and software; features; advantages and limitations; development projects; applications in business, education, medicine, and the military; and various styles in research.

The ECMECC Project
Westview High School, Braham, MN 55006, 612/396-3674,
Free project description (15-minute videotape description for $20.00)

Describes a program in which two-way television is used in teaching previously unoffered classes (calculus, college algebra, Spanish III, for example) in seven rural school districts. Commonly, a teacher in one classroom is viewed by two other classes through two-way television. This report includes a summary of the project, teacher training materials, and a summary of equipment requirements and operating costs.

Networks

"Finally...Computer Networks that Really Work."
Charles Rubin, *Personal Computing*, July 1985, v.9, n.7, p.68.

Presents an overview of current network improvements, costs and hardware plus how to network without networks. Contains descriptions of the IBM PC Network, AT&T's StarLan, Apple's AppleTalk, 3Com EtherSeries LAN, and Corvus's Omninet LAN. While this article focuses on business use, it could well apply to areas in education.

"Local Area Networks."
Frances Morse, *Teaching and Computers*, April/May 1988, v.5, n.6, p.27.

A veteran network manager at an elementary computer lab describes organization and operation of a local area network.

"Local Area Networks—Tying Computers Together: The Productivity Connection."
Russ Lockwood, *Creative Computing*, October 1985, v.11, n.10, p.70.

Defines LAN (local area network) boundaries and advantages, explains the industry's current developments, offers technical advice and suggests ways to succeed at implementation. Presents arguments for and against its use. Details the Open System Interconnection (OSI) reference model. Also includes a glossary of LAN terms, a comparison chart of 60 networks, and manufacturers' names and addresses.

Local Area Networks in Education: Overview, Application and Current Limitations
ERIC Clearinghouse on Educational Management, 1985
College of Education, University of Oregon,
Eugene, OR 97403, 503/686-5043, $4.00 + $2.00 Handling

A thorough, concise guide explaining local area networks (LANS) and their four interrelated elements: media, topology, channel access methods, and bandwidth. Describes a variety of instructional and management applications of LANS in schools. Four major limitations on the use of LANS are also discussed, as well as advice for school administrators.

"A Network Primer: When Is a Network Not a Network."
Ariella Lehrer, *Classroom Computer Learning*, February 1988, v.8, n.5, p. 39.

After discussing advantages and disadvantages of networks, proposes some inexpensive alternatives to full-fledged systems and lists their sources.

"The Network Story: What's Available/How They're Used"
Robert McCarthy, *Electronic Learning*, January 1988, v.7, n.4, p. 24.

Describes types of local area networks (LAN), purchasing considerations and gives brief highlights of a 1987 survey of LAN use in education.

Maintenance

Guides

The Plain English Maintenance and Repair Guide for IBM Personal Computers
Henry Beechhold, 1985
Simon & Schuster, 1230 Avenue of the Americas
New York, NY 10020, $14.95

True to its title, this is an easy-to-read and very informative guide. Includes collecting a computer tool kit; cleaning and maintaining disk drives, printer, monitor, and keyboard; building simple peripherals; and troubleshooting.

Keep Your Apple Running: The Common Person's Repair Guide
Alan Dunn, 1985
Consider It Dunn, PO Box 5362, Oregon City, OR 97045, $11.95

Whether you are fixing an Apple II+ or IIe or just attempting to understand how it functions, this step-by-step guide to microcomputer repair will come in handy. Contents include selecting necessary tools, isolating problems, working with components, and knowing computer parts. Contains practical, useful directions which are easy to read and fully illustrated.

Articles

"Care and Feeding of Your Micros."
Alan Merten, *Classroom Computer Learning*, September 1985,
v.6, n.1, p.40.

A list of preventive maintenance tips.

"Computer Insurance."
Edward Foster, *Personal Computing*, August 1985,
v.9, n.8, p.65.

Gives some practical advice on how to insure computers. Some firms specialize in computer insurance and the annual premiums are reasonable. Most general insurance policies exclude computers. Recommends full replacement value rather than cash value.

"Computer Rx."
James Levin, et al., *Electronic Learning*, September 1985,
v.5, n.1, p.55.

Brief but practical guide to diagnose hardware problems in any microcomputer. Includes list of preventive maintenance steps. Also a four-step troubleshooting guide for Apple II.

"Restoring Your Micro to Health."
Jerry Olivas, *Classroom Computer Learning*, September 1985, v.6, n.1, p.41.

Describes simple nontechnical maintenance tasks; detailed ways to troubleshoot; household tools to use in maintaining a computer; and helpful suggestions, such as documenting all repairs for future reference.

"Taking Care of Your Computer."
Christopher O'Malley, *Personal Computing*, May 1985, v.9, n.5, p.63.

Suggests preventive maintenance can prevent repair bills. Written for the layperson, this presents a long list of practical easy-to-do preventive steps. A side article, "Are Extended Warranties Worth It?," discusses different microcomputers' warranty and maintenance plans. Lists computer care product companies.

"Troubleshooting: A Hands-on Simulation."
Marjorie Helsel-DeWert and F. Steven Isom, *The Computing Teacher*, November 1987, v.15, n.3, p.25.

Describes in great detail a simulation to teach computer users how to troubleshoot problems with Apple IIe computes. Includes five copyable pages of handouts for the simulation that can be used with teachers or students.

"Troubleshooting: Dealing with a Misbehaving Apple."
Patrick Scott and Richard Howell, *The Computing Teacher*, February 1984, v.11, n.6, p.26.

Presents five problems an Apple Computer may have (such as "Printer will not print") and then lists step-by-step troubleshooting techniques.

"When the Chips Are Down."
Robert Scarola, *Popular Computing*, July 1985, v.4, n.9, p.73.

According to estimates, users with no technical experience can learn to fix up to 75% of their computer's problems. Stresses using simple tools. Know-how and troubleshooting ideas are examined in somewhat general terms.

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6. COMPUTER FACILITIES PLANNING

OVERVIEW

District planners must prepare to adapt the school site to meet the requirements of computers and other educational technology. This chapter lists the special characteristics of a computer facility. Resources at the end of this chapter will provide in-depth discussion of these characteristics and diagrams of various facility layouts.

Location

Depending upon need, frequency of use, instructional programs, and hardware availability, locations for computer facilities can be either centralized or decentralized.

Centralized. Centralized organization and implementation can provide the following benefits:

- convenient location for staff development
- focal point for computer use and management
- concentration of materials, including a software library
- reduction of possible distraction caused by classroom computers
- opportunity to maximize computer use through efficient scheduling
- location for group use by students and staff
- potential for networking the equipment
- greater security of equipment
- easier wiring and installation
- easier to monitor maintenance
- larger room is more conducive to high-quality instruction

A centralized site also has disadvantages:

- scheduling is difficult
- computers are less likely to be integrated into the curriculum
- reluctant staff can avoid using computers for classroom instruction and management

When selecting a centralized location, consider the following suggestions:

- place the program in an existing media center or in a self-contained environment
- select a large room, preferably on the second floor to increase security
- locate the room in a central place for easy access
- avoid a room that receives direct sunlight as this creates glare on monitors

Decentralized. Insufficient funding often limits the number of computers available to schools or districts. Access to this equipment therefore becomes more difficult and requires flexible scheduling and methods for utilizing the equipment. There are two approaches commonly used by districts to share scarce equipment: portable labs using computer vans or computers mounted on service carts; and single or multiple units installed in classrooms.

The advantages of a portable lab include:

- ability to begin a computer program on a shoestring budget
- provide computer access to students at different school sites

The disadvantages of portable labs include:

- greater potential for equipment breakdown from constant movement
- weather conditions may hamper movement
- inflexible work stations that may not provide appropriate space for legs, knees, and keyboarding
- mobile vehicle purchase and maintenance

The advantages of single or multiple units in classrooms:

- multiple units in a classroom increase the likelihood that computers will be integrated into the curriculum
- teachers more likely to use computers as instructional and/or management tool

The disadvantages include:

- computers not used throughout school day
- multiple units can be distracting to other classroom activities
- difficulty in coordinating software library materials with diverse teacher schedules
- with a single unit, access severely reduces the time available for hands-on experience

Environment

A computer facility is a special purpose environment that requires certain characteristics. Often classrooms must be adapted or renovated in order to create an environment that enhances student learning while maximizing teacher convenience. The following characteristics must be considered when planning a computer facility.

Space.

- consider the space needed at each station
  - room for computer, monitor, drives, keyboard, and printer
  - need for other input/output devices (mouse, graphics tablet)
  - student work space for worksheets, note taking, and documentation
- provide adequate space for largest anticipated group

Arrangement of Computers.

- Factors to consider
  - stand-alone or networked computers
  - teacher demonstration center
  - age groups using equipment
  - number of stations available
  - easy visibility of the demonstration area
  - number of students per station
  - all monitors visible to teacher

- Patterns for arrangement
  - U-shape
  - along walls
  - rows

Air Quality.

- Heating
  - avoid direct sun
  - keep temperature moderate
- Dust
  - write-and-wipeboards instead of chalkboards
  - cover portables or computers in rooms with chalk dust
- Humidity
  - dehumidifiers are necessary in humid climates

Light.

- ordinary classroom light sufficient
- use anti-glare screens

Electrical Requirements.

- Wiring
  - must have sufficient wattage to handle electrical needs; add special electrical panels/breakers
  - provide two master power switches one for all equipment, and one for monitors only (to control student attention)
  - voltage regulation to guard against power surges or power shortages

Furniture.

- Tables
  - consider table height, adjustability, space for student materials
  - provide molding for electrical outlets
  - must be strong
  - formica tops preferred
- Chairs
  - proper height in relation to table height

Demonstration Station.

- All standard equipment plus the following
  - large monitor or video projector
  - overhead projector
  - tool kit
  - large storage cabinet
  - modem, if necessary

Storage.

- Lockable wall cabinets
  - for software and instructional materials
  - temporary storage of extra hardware
  - support documentation
- Shelf space for student books and personal belongings

Security.

- locate on second floor if possible
- install alarm system—doors and windows
- safety bars on interior windows, if possible
- bolt computers to tables
- secure computer interiors (bolt access lids)

Telecommunication Lines.

- provide two-way communication cable
- provide telephone cables (2 lines)

Floors.

- consider static electricity
  - if carpeted, use low static type

CHECKLIST

Planning

Notes

________ 1. Location

Centralized

- Center or laboratory
- Library/media center

Decentralized

- Single or multiple units in classrooms
- Mobile unit(s)
- Mobile laboratory

________ 2. Environment

- Space
- Computer arrangement
- Climate control
  - temperature
  - dust
  - humidity
- Lighting
- Electrical requirements
  - power surge equipment
- Static
- Furniture
- Demonstration station
- Storage
- Security
- Telecommunication lines
- Floors

RESOURCES

Guides

Computer Lab Guidebook
MECC Distribution Center, April 1985
3490 Lexington Ave. N., St. Paul, MN 55126, 612/481-3500, $39.00

A comprehensive guide for creating and operating school computer labs. Highlighted are lab location, space requirements, arrangement of computers, security, access and storage. Additional chapters include planning, staffing, selecting software and hardware, and operating the lab. Includes checklist and transparency masters.

Designing Schools for Tomorrow's Technology
Houston Independent School District, Department of Technology,
5300 San Felipe, Houston, TX 77056, 713/960-8888, $6.50

Outlines steps a school district is taking to stay abreast of constant advances in hardware, software, and technology training. It is essential that the school facility is designed to accommodate changes. (From publisher's description.)

Organizing Your Computer Program - Lab vs. Classroom Usage
Computer Directions for Schools
P.O. Box 1136, Livermore, CA 94550, $7.95 + $2.00 Handling

A manual for organizing the computer facility; it details strengths and weaknesses of labs and classroom units. Includes: checklists of questions on management in labs and classrooms, strategies for scheduling use in labs and classrooms, an example computer lab lesson plan, and diagrams of lab and classroom layout.

Computer Laboratory Blueprint Narrative
Micromac, Rosemount High School, 14445 Diamond Path,
Rosemount, MN 55068, 612/423-9301, $25.00

This blueprint package provides specifications for the building of computer lab tables and possible classroom configurations for their use. Built in the school's Industrial Arts program, these tables have been in use for the last three years.

Articles

"The Computer Lab: Where It Helps and Where It Doesn't."
Glenn Fisher and LeRoy Finkel, *Electronic Learning*, October 1984, v.4, n.2, p.52.

Lists the advantages and disadvantages of centralizing computers within a lab. The two major advantages are the ease of administering and instruction. Territorial concerns and the fact that the computer is no longer a classroom tool are the major drawbacks.

"Computer Labs in Schools."
Mollie Brown, *SIG Bulletin*, 1984, v.1, n.4, p.42.

This article focuses on general development of a computer lab facility and explores the issues of location, security, electrical wiring, general atmosphere, and supplementary conveniences.

"The Computer Train: Mobilizing Your Micros."
Tim Crawford, *The Computing Teacher*, November 1984, v.12, n.3, p.54.

A brief review of mobile computer labs. Featured are suggestions for mobile lab users and several diagrams of the mobile facilities.

"Design Considerations for Planning a Computer Classroom."
Gregory Sales, *Educational Technology*, May 1985, v.25, n.5, p.7.

Discusses the issues that should be considered in setting up an efficient computer classroom. Major issues addressed are: plan development, room selection, power, lighting, telecommunications, reducing equipment problems, and furniture selection.

"Designing Schools for Tommorrow's Technology."
Draper Kauffman and Charles Lamkin, *AEDS Monitor*, July/August 1984, v.23, n.1-2, p.10.

The author presents a forecast of the next four generations of educational computer technology and its impact on school design and renovation. Listed are requirements for consideration which include flexibility, use, co-existence of new and old systems, lighting, noise control, and provisions for adequate power and phone lines. Several appendices and a thorough bibliography are included.

"How to Set Up a Computer Environment."
Peter Coburn, et al., *Classroom Computer News*, January/February 1982, v.2, n.3, p.29.

This article considers factors that usually affect decisions on where computers should be placed and how they are to be used. Factors include physical layout, constraints to networking, security and access to computers, information and documentation requirements, and rules for successful resource room usage.

"The Learning Center Classroom."

Jeri Hopkins, *The Computing Teacher*, December/January 1986, v.13, n.5, p.8.

Outlines how to reorganize your classroom into learning centers that include a computer center. Includes three floor plans (for primary, middle, and secondary classrooms), schedules, and how to plan room rearrangement.

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7. BUDGETS AND FUNDING

OVERVIEW

The amount of funding required for a computer technology program is directly related to the goals and objectives of your technology plan. For many districts, adequate funding requires restructuring of budgets and acquisition of outside funds. This chapter presents issues to consider while developing a new budget structure and includes resources on funding and budgeting.

Budgets

How to best allocate funds for the components of a new program is a difficult question. There is no single answer but several allocation models have been developed that are useful as starting guidelines. The following three budget models have been selected to illustrate possible allocation schemes.

Model 1: The 2% Solution (David Moursund, 1984)

This model uses an arbitrary small percentage (2%) of a district's total operating budget (Assumption $2,500 per student). It creates a simple but useful formula for allocating the resulting funds.

The instructional computing budget is broken into five categories with the following percentages allotted out of the total:

- Hardware: approximately 50%
- Software, print materials: approximately 16%
- Inservice: approximately 8%
- Computer coordinators: approximately 16%
- Contingency: approximately 8%

These proportions will change as the program moves from its initial stages.

Model 2: Amortized cost expenditures (M. Tim Grady, 1983)

Rather than taking a set budget based on a percentage of a district's funds and creating a program from within these constraints, Grady has projected what he sees as an adequate program and then determines the funding necessary to make it operational. He then amortizes the approximate cost of the program in a per pupil basis over a five-year period.

Model 3: Establishing a computer lab on initial $20,000 budget (Northwest Regional Educational Laboratory, 1984)

• Hardware (10 microcomputers @ $1000)	50%	$ 10,000
• Staffing (computer coordinator, 1/2 day)	35%	7,000
• Courseware (application programs)	5%	1,000
• Supplies	10%	2,000

Costs

Meeting the goals and objectives of a computer technology program requires an examination of both initial costs and ongoing costs. A brief review of these two types of expenditures follows.

Initial Costs.

- Courseware Acquisition—Depending on the goals and objectives of the program, courseware will require a large portion of initial funds. Application programs such as word processors and spreadsheets cost between $100-$400 each. Instructional courseware costs between $30-$90 each. Multiple copy agreements are available with many software publishers.
- Staffing—It is common for districts implementing a long-range computer program to hire a computer coordinator. A coordinator will be responsible for the implementation of the computer plan prepared by the district. It may be necessary to hire this individual at an administrative level.
- Hardware—This will consume the bulk of initial expenditures. Purchasers must not only consider the basic machines but also the peripherals, power cords, and demonstration equipment as funds allow.
- Site Acquisition—Expenditures may include remodeling an existing room to provide for current and future equipment requirements. Special furniture will need to be purchased or existing furniture modified to meet computer requirements.

Ongoing Costs.

- Staff Training—Staff will need to be retrained to incorporate this new technology into their curriculum. This can be accomplished through ongoing workshops and conferences. Teachers should be encouraged to take courses at colleges offering degrees in the use of educational technology.
- Maintenance Contracts and Fees—Students can be hard on equipment. Most hardware warranties last 90 days to one year. It is necessary, therefore, to establish maintenance contracts. These contracts generally run about ten percent of the total hardware costs.
- Courseware Updating—As the program grows and changes, additional courseware will be needed. This expenditure will remain relatively constant through the years.
- Hardware Updating and Acquisition—The state-of-the-art in hardware development is in constant flux and useful hardware life runs three to seven years. It is important to allot monies to upgrade and replace current equipment.
- Supplies—A computer program has many expendable items. Printer paper, diskettes, printer ribbons, etc., are among the types of supplies that will require ongoing replacement.
- Periodical Subscriptions—There are many magazines and journals that provide information for a technology program. These focus on specific use of computers in education or may deal with computers in general. They are useful for keeping current with the rapid changes in the field. (For titles see Chapter Eight: Professional Support.)

- On-line Time, Cable Subscription—Part of a schools' long-range goals may include access to on-line databases and electronic bulletin boards. Services like Ed-Net, Specialnet, CompuServe and The Source provide national fee services for access to their information bases.
- Insurance—Be sure to insure the new hardware and courseware acquisitions against theft, fire or physical damage. Coverage should also include off-campus loaning of equipment.
- Supplementary Materials—Prepare a contingency fund to handle unexpected expenditures.

Funding

Funding can come from a variety of sources. Some of the areas to begin your search include: federal funding, state funds, federal and private grants, and district/business partnerships.

Federal Funds. The U.S. Department of Education has several state and national grant programs that can assist districts in funding new technology programs. These include:

- Adult Education Grants
- Federal Assistance to Meet Special Needs of Disadvantaged Children
- Vocational Educational Program Improvement and Supportive Service
- Chapter I/Chapter II Block Grants

State Funds. Funding from state governments has generally come from state discretionary funds. Some state legislatures have allotted funds specifically for the development of new technology programs.

Private Funds. Many microcomputer companies have grant monies available for education. The companies include:

- Apple Education Affairs, 20525 Mariani Avenue, Cupertino, CA 95014
- Tandy Corporation Educational Grants Program, 1600 One Tandy Center, Fort Worth, TX 76102
- Commodore Computers, Matching Grants for Education, 1200 Wilson Drive, West Chester, PA 19380

Grants. There are many private foundations and individual trusts that have funding available for educational technology programs. However, these institutions must determine the worth of your project in order for the district to acquire the funds. If you do not have a grant writer on staff, refer to the various journal articles and books at the end of this chapter to assist in the development of grant proposals.

Business/Local Partnerships. Districts may wish to get the community involved with the development of their computer program. Businesses are sometimes willing to donate their time or equipment to benefit community schools.

Cost Savers.

- Participate in Mass Purchase plans—Mass purchase plans help ensure that districts get the best prices available. State, regional or local consortia can be established to facilitate mass purchase plans.
- Solicit Donations—Several recent federal tax incentives have been proposed to encourage computer corporations to donate hardware to educational programs.
- Consider Lease-Purchase Options—It may be possible to reduce initial hardware costs by arranging lease-purchase agreements.

CHECKLIST

Initial Costs

Notes

__________ 1. Hardware acquisition

__________ 2. Site acquisition

__________ 3. Courseware acquisition

__________ 4. Staffing

Ongoing Costs

__________ 1. Staff development

__________ 2. Maintenance contracts and fees

__________ 3. Courseware updating

__________ 4. Hardware upgrading and acquisition

__________ 5. Supplies

__________ 6. Journal subscriptions/school newsletter

__________ 7. On-line time, cable subscriptions

__________ 8. Insurance

__________ 9. Supplementary materials

Funding Sources

__________ 1. Federal funding

__________ 2. Regional funding

__________ 3. Private funding

__________ 4. Local funding

__________ 5. Business partnerships/donations

Cost Savers

Notes

________ 1. Mass purchase plans

________ 2. Donations

________ 3. Lease-purchase options

RESOURCES

Note: Several planning guides listed in Chapter One, contain chapters on budgets and funding.

Articles on Budgeting

"The Two Percent Solution."

David Moursund, *The Computing Teacher*, March 1984, v.11, n.7, p.3.

The author recommends that two percent of the total school budget be allotted for educational computing expenditures. The funds are divided into five categories: hardware, software and materials, inservice education, coordinators and contingency funds. Each area is examined as to the proportion of funds it will receive.

Funding Guides

Foundation Grants Guide for Schools, Museums and Libraries
International Communications Industries Association (ICIA), 1984
3150 Spring Street, Fairfax, VA 22031, $9.95 + $1.50 Handling

A listing of foundations that grant monies to public and private libraries, museums, elementary, secondary, and postsecondary schools. Over 95 foundations of interest to schools are listed by address, telephone number, contact person, geographic restrictions, and educational funding levels.

How to Tap Into Private Sector Funding for Schools
Educational Funding Research Council
1611 North King Street, Suite 508, Arlington, VA 22209, $37.50

Description not available.

Radio Shack's Proposal Writing Guide
Norman Bell and Frank Jackson
Available from Radio Shack stores, $9.95
Catalog No. 26-2754

A guide designed for the novice grant writer. Written as a step-by-step guide, it provides practical explanations, various examples, and numerous exercises to assist in successful grant writing experiences. Topics reviewed include defining problem areas, documenting the need for a grant, and setting grant objectives. The guide includes required resources and describes evaluation plans.

The Complete Tax Incentive Guide and The Approved Methods for Donating or Accepting Corporate Gifts of Inventory
Thomas Lee and Margaret Carr, 1985
The American Association for Corporate Contributions
P.O. Box 6401, Evanston, IL 60204, $20.50 (Price includes postage)

Details how nonprofit organizations and schools can utilize the IRS's Special Contributions Rule to receive free donations of new merchandise from manufacturers and distributors. It answers such questions as: What kinds of material can be donated?, What restrictions are placed on donations?, and How to find corporate donors who give contributions of merchandise.

The Foundation Directory and The Foundation Center
The Foundation Center
88 Seventh Avenue, New York, NY 10106, 800-424-9836

This service provides a complete list of addresses and phone numbers of funding sources. Other services include computer printouts, indexed by subject, of grants over $5,000; foundation annual reports; sample application forms and guidelines; books and periodicals on proposal writing and fund raising; and workshops and special orientations.

Articles on Funding

"Finding Funding for Your Computer Project."
Theodore F. Schwartz, *Classroom Computer Learning*, March 1984, v.4, n.8, p.36.

This is a general overview of how to acquire information about public and private funding sources. The author notes how to request information, how to identify active funding sources, and how to promote fund raising in the community. Listed are 11 major funding sources.

"Four Ways to Increase Your Community's Financial Support."
Claudia A. Long, *Electronic Learning*, March 1985, v.4, n.6, p.39.

Describes four low-cost strategies schools can use to bolster community involvement based on current interests in computers. Includes six ways to get parents involved with computer activities at school.

"Funding Computer-Related Technology in the Public Schools."
James H. Stronge, *Computing Teacher*, August 1983, v.11, n.1, p.13.

The author recommends that a variety of potential sources be identified to fund particular aspects of the computer program. A tentative plan is developed and potential funding sources are given. A summary chart matching funding sources to program components is included.

"How to Raise Money in Your Community."
Robert Newman, *Electronic Learning*, September 1982, v.2, n.1, p.43.

Discusses how one school administrator involved community business leaders in a plan to raise funds for computer hardware.

"Money for Micros."
Electronic Learning, March 1984, v.3, n.6, p.39.

Supplies names, addresses and descriptions of national, regional, and commercial funding sources. Also lists legislation that has an economic impact on the development of educational technology programs.

"New Revenues: Computer Training as a Business Venture."
Elizabeth Farmer Schwartz, *The Computing Teacher*, March 1988, v.15, n.6, p.4.

Describes how funding for computers in one school district has been provided by offering computer training to business and industry. Explains fees and salaries and describes a hardware purchase option for instructors.

Articles on Grant Writing

"Computers + Teachers = Computeach."
Richard Mone, *Computing Teacher*, April 1982, v.9, n.8, p.42.

Article reviews a step-by-step description of how an idea is translated into a completed grant proposal. The paper is divided into three sections: how to get started, the five essential parts of a grant proposal, and a detailed example of a completed grant proposal.

"How to Write a Winning Proposal."
Patricia Sturdivant, *Electronic Learning*, October 1981, v.1, n.2, p.26.

Reviews potential funding sources and provides 14 tips that will "improve the impact of any proposal." Addresses and cost services are provided for eight funding resources.

"So You Want to Get a Grant: Some Advice from the Experts."
Anne L. Bailey, *Change*, January/February 1985, v.17, n.1, p.40.

This paper presents advice on grantsmanship from several top grant givers and grant getters. Based on these interviews, it presents seven preparatory steps to grant writing, three essential grant writing principles, and six elements common to all proposals. Nine references to grantsmanship and funding sources are listed at the end of the article.

"Writing Grant Proposals: Dispelling the Myths."
Sharon O'Bryan-Garland and Robert Larson, *Spectrum*, Summer 1984, v.2, n.3, p.31.

This article seeks to dispel many of the myths that impede smaller districts and individuals from writing grant proposals. The authors discuss techniques used by successful grant writers, methods for increasing the possibility of success and recommendations for preparing grant proposals.

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8. RESOURCES FOR PROFESSIONAL SUPPORT

This chapter expands the previous lists of resource materials by topic area with a selected guide to: national organizations and technical centers, state level educational technology specialists, and periodicals.

NATIONAL ORGANIZATIONS

Associations

National associations provide members with the opportunity to exchange ideas and information through conferences, journals, and newsletters. The following associations either partially or totally focus their activities on educational computing. Many of these associations have local and regional chapters to support their members.

THE AMERICAN COMPUTER SCIENCE LEAGUE (ACSL)
P.O. Box 2417A
Providence, RI 02906
401/331-2275

Purpose: Devoted to computer science education at the secondary level, ACSL conducts monthly computer science contests for junior and senior high school students. Prizes are awarded to outstanding schools at local and regional levels. A monthly newsletter publishes the contest results.

AMERICAN SOCIETY FOR INFORMATION SCIENCE (ASIS)
1424 Sixteenth Street, Suite 404
Washington, DC 20036
202/462-1000

Purpose: ASIS fosters and leads in the advancement of information science and technology. Membership is opened to anyone interested in information and its transfer.

Conferences: Two meetings yearly, plus participation in the National Computer Conference

AMERICAN STATISTICAL ASSOCIATION (ASA)
1429 Duke Street
Alexandria, VA 22314
803/684-1221

Purpose: ASA fosters unity and effectiveness of effort among all concerned with statistical problems and seeks to promote statistics as a contribution to society. ASA members are interested in the development or application of statistics in all areas of science.

Conferences: Annual meeting

ASSOCIATION FOR COMPUTATIONAL LINGUISTICS (ACL)

c/o Dr. D. E. Walker
Bellcore, MRE 2A379
445 South Street, Box 1910
Morristown, NJ 07960-1910
201/829-4312

Purpose: ACL is dedicated to the broad range of computational linguistics; both natural languages and computation. Research, development, and dissemination of information to both professionals and the general public are two of its goals. Membership is comprised of those interested in computational linguistics.

Conferences: Annual conference plus special conferences

Journal: *Computational Linguistics*

ASSOCIATION FOR COMPUTING IN MATHEMATICS AND SCIENCE TEACHING

P.O. Box 4455
Austin, TX 78765

Purpose: Professional organization for those using computers in teaching math and science in high school and college.

Journals: *Journal of Computers in Mathematics and Science Teaching*

ASSOCIATION FOR COMPUTING MACHINERY (ACM)

11 West 42nd Street
New York, NY 10036
212/869-7440

Purpose: ACM is dedicated to the promotion of free interchange of information about the sciences and arts of information processing. ACM is made up of special interest groups in computers and society, personal computing, computer science education, computer use in education, and the ACM Elementary and Secondary School Subcommittee.

Journals: *Communications of the ACM*
Journal of the Association for Computing Machinery

Newsletters: *SIGSE Bulletin* (Computer Science Education)
SIGCUE Bulletin (Computer Uses in Education)

Conferences: One national and several regional conferences each year

ASSOCIATION FOR THE DEVELOPMENT OF COMPUTER-BASED INSTRUCTIONAL SYSTEMS (ADCIS)

409 Miller Hall
Western Washington University
Bellingham, WA 98225
206/676-2860

Purpose: ADCIS promotes investigation and utilization of computer-based instruction and management. It brings together developers and users for the interchange of information, programs and materials.

Journals: *Journal of Computer-Based Instruction*

Newsletters: *ADCIS News*

ASSOCIATION FOR EDUCATIONAL COMMUNICATIONS AND TECHNOLOGY (AECT)

1126 16th Street N.W.
Washington, DC 20036
202/466-4780

Purpose: AECT promotes effective uses of media and technology in education and works to increase understanding of educational computing.

Journals: *Journal of Instructional Development*
Tech Trends

THE COMPUTER SOCIETY

1730 Massachusetts Avenue N.W.
Washington, DC 20036-1903
202/371-0101

Purpose: The Computer Society, the largest consituent society of the Institute of Electronic and Electronics Engineering, advances the theory, practice, and application of computer information processing science and technology, including all aspects of design, theory, and practice related to digital and analog devices, circuits, systems, computation, and information processing. It is the world's largest association of computer professionals.

Publications: Five magazines, three journals, over 500 book titles

Conferences: One of the founding societies of the National Computing Conference; sponsors over 60 conferences, workshops, and symposia.

DATA PROCESSING MANAGEMENT ASSOCIATION (DPMA)

505 Busse Highway
Park Ridge, IL 60068-3191
312/825-8124

Purpose: DPMA is a professional organization serving the needs of information processing and computer management personnel. Their primary objectives include: education and research activities focused on the development of effective management programs, and encouraging high standards of competence and promotion of a professional attitude.

Journals: *Data Management*

Newsletters: *Inside OPMA*
C2YOUR Computer Career (for students)

Conferences: Provide self-study courses, seminars and an annual international conference

INSTRUMENT SOCIETY OF AMERICA (ISA)

P.O. Box 12277
Research Triangle Park, NC 27709
919/549-8411

Purpose: ISA is a scientific, technical, and educational organization dedicated to advancing arts and sciences related to instruments and controls in various sciences and technologies. Computer technology is one of the vast areas embraced. Membership is open to anyone interested in instrumentation.

Conferences: Provides conferences, symposia, and exhibits

INTERNATIONAL ASSOCIATION FOR COMPUTING EDUCATION (IACE)

1230 17th Street N.W.
Washington, DC 20036
202/223-0709

Purpose: IACE is a professional organization serving educators and data processing personnel interested in computer science and in intructional and administrative computing. (Formerly the Association for Educational Data Systems.)

Journals: *Journal of Research on Computing in Education*

Newsletters: *IACE Newsletter*

Conferences: Provides workshops, seminars and an annual conference

INTERNATIONAL COUNCIL FOR COMPUTERS IN EDUCATION (ICCE)

University of Oregon
1787 Agate Street
Eugene, OR 97403
503/686-4414

Purpose: ICCE is a professional organization for people interested in instructional computing at the precollege level. There are 42 regional organizations. ICCE publishes a series of instructional computing booklets.

Journals: *The Computing Teacher*
SIG Bulletin

INTERNATIONAL COMMUNICATIONS INDUSTRIES ASSOCIATION (ICIA)

3150 Spring Street
Fairfax, VA 22031
703/273-7200

Purpose: ICIA is a trade association advocating the use of educational technology. They offer research information on the funding and use of classroom computers.

Publications: Audio-Visual Equipment Directory (annually)

NATIONAL COUNCIL OF TEACHERS OF ENGLISH (NCTE)

1111 Kenyon Road
Urbana, IL 61801
217/328-3870

Purpose: NCTE has been a leading advocate of the use of computers in the fields of reading and language arts. Among its publications is a "Guideline for Review and Evaluation of English Language Arts Software."

Journals: *Language Arts*
English Journal
Computers in Reading and Language Arts

NATIONAL COUNCIL OF TEACHERS OF MATHEMATICS (NCTM)

1906 Association Drive
Reston, VA 22091

Purpose: NCTM is a professional organization whose purpose includes promoting the use of computers in mathematics education. It has developed software evaluation guides and provides seminars and conferences on the development and use of computer based mathematics curriculum.

Journals: *Arithmetic Teacher*
Mathematics Teacher

Conferences: Provide an annual conference, regional workshops, and seminars

NATIONAL SCIENCE TEACHERS ASSOCIATION (NSTA)

1742 Connecticut Avenue, N.W.
Washington, DC 20009

Purpose:	NSTA is a professional organization whose purpose includes exposing science educators to ideas and applications of computer technology in science instruction.
Journals:	*The Science Teacher* *Science and Children* *Science Scope*

SOCIETY FOR COMPUTER SIMULATION (SCS)

P.O. Box 17900
San Diego, CA 92117
619/277-3888

Purpose:	SCS promotes the development of simulation technology and its application in all fields. Associate memberships are open to anyone interested in the technology of simulation or in applications of the computer arts and sciences.
Journals:	*Simulation*
Conferences:	Approximately five major technical conferences annually

SOCIETY FOR INDUSTRIAL AND APPLIED MATHEMATICS (SIAM)

117 South 17th Street
Suite 1400, Architects Building
Philadelphia, PA 19103-5052
215/564-2929

Purpose:	SIAM furthers the application of mathematics to problems in industry and science. SIAM develops media in the area of basic analytical thought and new mathematical methods.
Journals:	*SIAM News* and nine others
Conferences:	Various conferences, national meetings

SOCIETY FOR INFORMATION DISPLAY (SID)

8055 West Manchester Avenue
Suite 615
Playa Del Rey, CA 90293
213/305-1502

Purpose:	SID is dedicated to the scientific advancement of information display as well as disseminating information.
Journals:	*Proceedings of the Society for Information Display*
Conferences:	Sponsors a major yearly conference, co-sponsors another, as well as provides technical meetings, field trips, seminars, and tutorials

Resource Centers and Organizations

Various research organizations, nonprofit organizations, and educational institutions furnish useful services, products, and information concerning the use of computers in education. These national organizations represent the leading edge in educational advances and product development. The following are a few of the resources and centers with a focus on educational computing.

CENTER FOR RESEARCH ON LEARNING AND TEACHING (CRLT)
109 E. Madison Street
Ann Arbor, MI 48104

CRLT provides innovative projects and ideas on the use of computers in education. It disseminates information on computer systems, communications networks, funding sources, professional organizations, conferences, and materials in print.

CENTER FOR STUDY OF EDUCATIONAL TECHNOLOGY
MECC/University of Minnesota
Office of the Dean, Burton Hall
Minneapolis, MN 55455
612/481-3500

This partnership between a higher education institution and a private corporation provides original research into the design and effects of technology in education. Periodic reports on current research activity are available.

CENTER FOR SPECIAL EDUCATION TECHNOLOGY
1920 Association Drive
Reston, VA 22091
800/345-8325

This federally funded project of the Council for Exceptional Children monitors new and existing technology appropriate for special education. The center maintains a database of special education software and offers searches and technical assistance.

CUE SOFTSWAP
P.O. Box 271704
Concord, CA 94527-1704

Softswap is a clearinghouse for information on inexpensive, freely copyable educational software developed by teachers. The software is screened and refined before distribution.

EDUCATIONAL TECHNOLOGY CENTER
Harvard University
337 Gutman Library
Cambridge, MA 01238
617/495-9373

A federally funded center designed to find ways of using educational technology to teach science, math and computing. The center will design software and instructional materials to help students understand some of the most frequently misunderstood relationships in math and science. *ETC Targets*, a free quarterly newsletter available on request, announces new publications and describes current activities.

EDUCATIONAL TECHNOLOGY CENTER
University of California
Irvine, CA 92717

The Educational Technology Center conducts several projects related to the development of computer-based instruction at all levels.

EDUCATIONAL TESTING SERVICE (ETS)
Computer Education Programs
Rosedale Road
Princeton, NJ 08541
609/921-9000

ETS acts as an educational training center for teachers and administrators. Housing over 3,500 educational software programs, this program focuses on instructional and administrative applications of computers. ETS also acts as a clearinghouse for educational software.

NATIONAL EDUCATIONAL COMPUTER LIBRARY (NECOL)
P.O. Box 293
16 Main Street
New Milford, CT 06776

This association acts as a national resource center and clearinghouse for information on educational computing. It sponsors educational computing conferences throughout the United States and publishes a newsletter, *The National Educational Review*.

NATIONAL SPECIAL EDUCATION ALLIANCE
Apple Computer, Inc.
Office of Special Education/NSEA
20525 Mariani Ave., M/S 36-M
Cupertino, CA 95014

This alliance links 11 established local and regional centers that provide resources and information about computers and other technology to aid the disabled. Each member center conducts training workshops and product fairs.

PROJECT SERAPHIM
Department of Chemistry
Eastern Michigan University
Ypsilanti, MI 48197
313/487-0368

This project focuses on software for chemistry education through postsecondary level. It distributes over 600 software programs developed by chemistry teachers, provides training through a national netwrok of science teachers, and supports new software development. A new publication, *Journal of Chemical Education: Software*, provides high quality, peer-reviewed software on floppy disk with written support materials.

TECHNICAL EDUCATION RESEARCH CENTER (TERC)

1696 Massachusetts Avenue
Cambridge, MA 01238
617/547-0430

The Computer Resource Center of TERC houses information on software and hardware. Visitors to the center can try various microcomputer products and inspect educational software. The center provides workshops on programming and the application computers in instruction. TERC publishes a newsletter on educational computing titled, *Hands On.*

STATE TECHNOLOGY SPECIALISTS

Each state employs an educational technology specialist who can recommend regional organizations or local user groups, preview sites, and technical centers. Regional organizations are similar in purpose to national organizations. Local user groups allow teachers and administrators to directly exchange ideas, materials, and advice about their particular hardware and software concerns. Together, there are nearly 400 of these organizations. The following is a list of technology contacts by state or territory. This office should be able to provide current regional information.

ALABAMA
Ron Wright
Computer Specialist
Alabama State Dept. of Educ.
State Office Bldg.
Montgomery, AL 36130
205/261-2744

ALASKA
Darby Anderson
Administrator, Educ. Program Support
Alaska Dept. of Educ.
P.O. Box F
Juneau, AK 99811
907/465-2824

AMERICAN SAMOA
Russell Aab
Math/Computer Coordinator
Dept. of Educ.
American Samoa 96799
OS*633-4853

ARIZONA
Ralph Ferguson
Director of Educ. Technology
Arizona Dept. of Educ.
1535 W. Jefferson St.
Phoenix, AZ 85007
602/255-4273

ARKANSAS
Cecil McDermott
Director, Project IMPAC
National Old Line Bldg., Room 122
6th and Woodbine Streets
Little Rock, AR 72201
501/371-1401

CALIFORNIA
Donavan Merck
Director, Office of Educ. Technology
California Dept. of Educ.
721 Capitol Mall
Sacramento, CA 95814
916/324-1961

COLORADO
Jerry Scezney
Senior Consultant, Educ. Technology
Colorado Dept. of Educ.
201 E. Colfax Ave.
Denver, CO 80203
303/8660-6856

CONNECTICUT
Robert Hale
Acting Chief, Bureau of Curriculum
Connecticut Dept. of Educ.
P.O. Box 2219, Room 375
Hartford, CT 06145
203/566-4111

DELAWARE
William Geppert
State Supervisor, Mathematics
Delaware Dept. of Public Instruction
P.O. Box 1402
Dover, DE 19901
302/736-4885

DISTRICT OF COLUMBIA
Kyo Jihn
Assistant Superintendent
District of Columbia Dept. of Educ.
Rabaut Jr. High
North Dakota and Kansas Sts., N.W.
Washington, DC 20004
202/576-6288

FLORIDA
David Brittain
Administrator, Educ. Technology
Florida Dept. of Educ.
Knott Bldg.
Tallahassee, FL 32301
904/488-0980

GEORGIA
Max Wilson
Director, Division of Instruction
Media Services
2054 Twin Towers East
Atlanta, GA 30334
404/656-5945

GUAM
Jeffrey Shafer
Dept. of Educ.
P.O. Box DE
Agana, Guam 96910
808/247-5930

HAWAII
Evelyn Horiuchi
Educ. Specialist
Hawaii Dept. of Educ.
189 Lunalilo Home Rd., 2nd Floor
Honolulu, HI 96825
808/395-8916

IDAHO
Mark Kuskie
Consultant, Educ. Tech.
Idaho Dept. of Educ.
650 W. State St.
Boise, ID 83750
208/334-2165

ILLINOIS
Ray Schaljo
Coordinator, Technical Services
Illinois State Board of Educ.
100 N. First St.
Springfield, OR 62777
217/782-5728

INDIANA
Phyllis Land Usher
Senior Officer
Center for School Improvement
and Performance
Indiana State Dept. of Educ.
Room 229, State House
Indianapolis, IN 46204-2798
317/269-9607

IOWA
Leland Tack, Division Administrator
Planning, Evaluation and Information
Services
Iowa Dept. of Public Instruction
Grimes Office Bldg.
Des Moines, IA 50319
515/281-4835

KANSAS
Craig Haugness
Computer Educ. Specialist
Kansas State Dept. of Educ.
120 E. 10th St.
Topeka, KS 66612
913/296-7285

KENTUCKY
Lydia Sledge
Dir. of Mathematics and Tech.
Kentucky Dept. of Educ.
1828 Capitol Plaza Tower
Frankfort, KY 40601
502/564-2672

LOUISIANA
Michael Schouest
Director, M.I.S.
Louisiana Dept. of Educ.
3455 Florida Blvd.
Baton Rouge, LA 70806
504/342-1809

MAINE
Richard Riley
State Technology Coord.
Maine Dept. of Educ.
Educ. Bldg. #23
Augusta, ME 04333
207/289-5815

MARYLAND
Frank Windsor
Chief, Language and Learning
Improvement Branch
Maryland Dept. of Educ.
200 W. Baltimore St.
Baltimore, MD 21201
301/659-2336

MASSACHUSETTS
Susan Foote
Coordinator of Instructional
Technology
Massachusetts Dept. of Educ.
75 Acton St.
Arlington, MA 02174
617/641-3710

MICHIGAN
James Phelps
Associate Supt., Planning and School
Management
Michigan Dept. of Educ.
P.O. Box 30008
Lansing, MI 48909
517/373-3909

MINNESOTA
Gil Valdez
Minnesota State Dept. of Educ.
550 Cedar St.
St. Paul, MN 55101
612/296-4067

MISSISSIPPI
Pat Teske
Instruc. Tech. Specialist
Mississippi Dept. of Educ.
P.O. Box 771, Bur. of Sch. Imp.
Jackson, MS 39205
601/359-3768

MISSOURI
Tom Odneal
Dir., Inst. Imp. and Resources
Dept. of Elem./Sec. Educ.
P.O. Box 480
Jefferson City, MO 65102
314/751-3175

MONTANA
Dan Dolan
Office of Public Instruction
State Capitol
Helena, MT 59620
406/444-4436

NEBRASKA
Gerald Sughroue
Dir., Inst. Tech.
Nebraska Dept. of Educ.
301 Centennial Mall S.
Lincoln, NE 68509
402/471-2057

NEVADA
Frank South
Technology Consultant
Nevada State Dept. of Educ.
400 W. King St.
Carson City, NV 89710
702/885-3136

NEW HAMPSHIRE
Fernand Prevost
Consultant, Mathematics Educ.
New Hampshire Dept. of Educ.
101 Pleasant St.
Concord, NH 03301
603/271-2632

NEW JERSEY
Carol Scelza
Manager, Educ. Tech. Unit
New Jersey Dept. of Educ.
225 W. State St.
Trenton, NJ 08625
609/984-1805

NEW MEXICO
Susan Brown
Dir., Educator Preparation
and Licensure Unit
New Mexico Dept. of Educ.
Education Bldg.
300 Don Gaspar
Santa Fe, NM 87501-2786
505/827-6518

NEW YORK
Greg Benson
Dir., Cen. for Lng. Tech.
New York State Educ. Dept.
Room 9A47, Cultural Educ. Dept.
Albany, NY 12230
518/474-5823

NORTH CAROLINA
Elsie Brumback
Asst. State Supt., Media and
Technology Services
North Carolina Dept. of Pub. Inst.
Educ. Bldg., 116 W. Edenton
Raleigh, NC 27603-1712
919/733-3170

NORTH DAKOTA
Ron Torgeson
Dir., Info. and Research
North Dakota Dept. of Educ.
State Capitol
Bismarck, ND 58505
701/224-2289

NORTHERN MARIANA ISLANDS
Haruou Kuartei
Dept. of Educ.
Education Bldg., Lower Base
Saipan, NMI 96950
OS*9468

OHIO
Donna Pepper
Educ. Tech. Center Coord.
Ohio State Dept. of Educ.
S. Front St.
Columbus, OH 43266-0308
614/644-8564

OKLAHOMA
Mary Reid
Administrator
Curriculum/Inst. Computers
Oklahoma State Dept. of Educ.
2500 N. Lincoln Blvd.
Oklahoma City, OK 73105-4599
405/521-3361

OREGON
Don Erickson
Inst. Technologist
Oregon Dept. of Educ.
700 Pringle Parkway, S.E.
Salem, OR 97310
503/378-6405

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333 Market St.
Harrisburg, PA 17126-0333

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401/277-2638

SOUTH CAROLINA
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Dir., Off. of Inst. Tech.
South Carolina Dept. of Educ.
265 Rutledge Bldg.
Columbia, SC 29201
803/734-8090

SOUTH DAKOTA
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Director, Educ. Tech.
Dept. of Educ. and Cult. Affairs
Kneip Office Bldg.
Pierre, SD 57501
605/773-4699

TENNESSEE
Frank Ruckman
Director, Computer Education
Tennessee Dept. of Educ.
C3-303 Cordell Hull Bldg.
Nashville, TN 37219
615/741-6206

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Texas Education Agency
1701 N. Congress Ave.
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Utah Dept. of Educ.
250 E. 500 South
Salt Lake City, UT 84111
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Charlotte Amalie, St. Thomas, VI 00801

VIRGINIA
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Virginia Dept. of Educ.
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Ginny Tresvant
Dir. of Inst. Serv. and Tech.
Washington Dept. of Educ.
Old Capitol Bldg. FG-11
Olympia, WA 98504
206/753-3760

WEST VIRGINIA
Keith Smith
Deputy to the Bureau Chief
West Virginia Dept. of Educ.
930 Ridgemont Rd.
Charleston, WV 25305
304/348-2691

WISCONSIN
Carolyn Folke
Dir., Bureau for Inst. Media
and Technology
Wisconsin Dept. of Educ.
125 S. Webster, Box 7841
Madison, WI 53707
608/266-3856

WYOMING
Stephen King
Educ. Tech. Consultant
Wyoming Dept. of Educ.
Hathaway Bldg.
Cheyenne, WY 82002
307/777-6670

PERIODICALS

General Audience: Computers

BYTE (monthly)
BYTE Publications
Box 590
Martinsville, NJ 08836

Emphasizes technical information and applications. Each issue includes feature articles focusing on a theme.

CREATIVE COMPUTING (monthly)
Creative Computing
Box 5214
Boulder, CO 80321

Includes articles on computer applications, hardware and software reviews, interviews with leaders in the computing industry. (Merged with *A+ Magazine* as of December 1985.)

INFOWORLD (weekly)
InfoWorld
375 Cochituate Road
Box 837
Framingham, MA 01701

First-hand news on everything in the microcomputing industry. Includes technical and general information, new product information, and interviews.

PERSONAL COMPUTING (monthly)
Hayden Publishing Company
P.O. Box 2942
Boulder, CO 80322

Includes feature articles on microcomputer applications in business, education, and home.

POPULAR COMPUTING (monthly)
BYTE Publications
Box 307
Martinsville, NJ 08836

Geared to the novice user and features hardware and software reviews and articles.

General Audience: Education

Note: The following periodicals contain articles that have been cited in this handbook.

CHANGE (bimonthly)
American Association for Higher Education
4000 Albermarle Street N.W.
Washington, DC 20016
212/362-6445

Published under the editorial leadership of the American Association for Higher Education, this periodical is aimed at college administrators and professors. Topics of general interest and five regular columns.

EDUCATIONAL LEADERSHIP (monthly, 8 issues/year)
Association for Supervision and Curriculum Development
225 North Washington Street
Alexandria, VA 22314

Intended for school leaders or those interested in curriculum, instruction, supervision, and leadership in schools. Presents a general topic with many articles, plus other topics and departments including book reviews and letters.

NASSP BULLETIN (monthly, 9 issues/year)
National Association of Secondary School Principals
1904 Association Drive
Reston, VA 22091

A journal for middle and high school administrators. Features of general interest plus book reviews and letters.

SPECTRUM (quarterly)
Journal of School Research and Information
Educational Research Service Inc.
1800 North Kent Street
Arlington, VA 22209
703/243-2100

Topics on school management, policy, methods, finance, personnel relations, instructional programs, and so forth.

Educational Computing

CLASSROOM COMPUTER LEARNING (monthly, nine issues/year)
Learning Periodicals Group
19 Davis Drive
Belmont, CA 94002

Emphasizes classroom uses of computers with sections in each issue for uses in elementary, middle, and high schools.

THE COMPUTING TEACHER (monthly, nine issues/year)
International Council for Computers in Education
University of Oregon
1787 Agate Street
Eugene, OR 97403-1923

Articles emphasize teaching with and about computers. Includes software and book reviews and several regular columns geared to subject area teachers.

EDUCATIONAL TECHNOLOGY (monthly)
Educational Technology Publications
130 Sylvan Avenue
Englewood Cliffs, NJ 07632

Articles feature current research and trends in educational technology. Regular columns review software, literature, and audio-visual media.

ELECTRONIC LEARNING (monthly, eight issues/year)
Scholastic, Inc.
902 Sylvan Avenue
Englewood Cliffs, NJ 07632

Includes news briefs, applications of computers in education, software reviews, new product announcements, and results of surveys.

JOURNAL OF COMPUTER-BASED INSTRUCTION (quarterly)
Association for the Development of Computer-Based Instructional Systems (ADCIS)
ADCIS International Headquarters
Western Washington University
Mill Hall 409
Bellingham, WA 98225

Includes research reports and articles on computer-based instruction in pre-college, college, business, government and industry.

JOURNAL OF EDUCATIONAL COMPUTING RESEARCH (quarterly)
Baywood Publishing Company, Inc.
120 Marine Street
Farmingdale, NY 11735

Devoted to new research in the theory and application of educational computing.

JOURNAL OF EDUCATIONAL TECHNOLOGY SYSTEMS (quarterly)
Baywood Publishing Company, Inc.
120 Marine Street
Farmingdale, NY 11735

Investigates and reports on actual classroom experiences in the use of all technology and its impact on education.

JOURNAL OF RESEARCH IN COMPUTING IN EDUCATION
International Association for Computing in Education
1230 17th Street N.W.
Washington, DC 20036

Reports on original research, system or project descriptions and evaluations, syntheses of literature on computing in education, assessments of theoretical or conceptual positions which relate to the field of educational computing.

SIG BULLETIN (quarterly)
ICCE
University of Oregon
1787 Agate Street
Eugene, OR 97403
503/686-4414

A publication of the special interest groups (SIGs) of the International Council for Computers in Education, containing articles by and for administrators, special educators, teacher educators, computer coordinators, and videodisc users.

SIGCSE BULLETIN (quarterly)
Association for Computing Machinery,
Special Interest Group on Computer Education
11 West 42nd Street
New York, NY 10036
212/869-7440

Articles focus on the needs of computer science educators in secondary and postsecondary settings.

SIGCUE BULLETIN (quarterly)
Association for Computing Machinery, Special Interest
Group on Computer Uses in Education
11 West 42nd Street
New York, NY 10036
212/869-7440

Includes articles concentrating on educational computer applications. Also reports on the development of software, computer systems, and support hardware.

T.H.E. JOURNAL (monthly, 10 issues/year)
Information Synergy, Inc.
P.O. Box 15126
Santa Ana, CA 92713

Includes articles on technology in education focusing on a theme each issue. Regular columns announce conferences, and new products.

TEACHERS AND COMPUTERS (monthly/eight issues)
Scholastic, Inc.
730 Broadway
New York, NY 10003-9538

Emphasizes computer activities for the elementary school classroom, including complete teaching units, reproducible masters, posters, a kid-section, and task cards.

TEACHING, LEARNING, AND TECHNOLOGY (quarterly)
Center for Research Into Practice
1718 Connecticut Ave., N.W.
Washington, DC 20009
202/537-1620

Provides summaries of the research in technology in education and reviews the research on applications of computers, videodisc, and multi-media in instruction.

TECH TRENDS (monthly, eight issues/year)
Association for Educational Communications and Technology
1126 Sixteenth Street N.W.
Washington, DC 20036
202/466-4780

Presents practical, helpful articles of general interest for the educator using computers. Departments discuss computer trends, new products, and instructional resources. (Formerly *Instructional Innovator.*)

Newsletters

C.U.E. NEWSLETTER (bimonthly)
Computer-Using Educators, Inc.
Box 18547
San Jose, CA 95158

Published by one of the largest user groups of computer educators based in California.

HANDS-ON (quarterly)
Technical Education Research Centers
1696 Massachusetts Avenue
Cambridge, MA 02138

Reviews software, books, conference information. Provides open forum and current topics of interest to educational readers.

MICROGRAM (monthly, eight issues/year)
MicroGram
EPIE Institute
P.O. Box 839
Water Mill, NY 11976

Features current developments in educational computing, EPIE's Pro/File courseware evaluations, and items of interest to computing educators.

RESEARCH IN WORD PROCESSING (monthly, nine issues/year)
South Dakota School of Mines and Technology
Rapid City, SD 57701

Reviews research associated with writing programs.

SCHOOL TECH NEWS (monthly, eight issues/year)
951 Pershing Drive
Silver Springs, MD 20910-4460

Includes timely news briefs, interviews with leaders in educational computing, new product announcements, and a calendar of events.

THE WORKS NEWSLETTER
David Chesebrough, editor
P.O. Box 72
Leetsdale, PA 15056

Offers help on AppleWorks from and for teachers, students, and parents. Includes reviews of software, hardware, and books.

GLOSSARY OF COMPUTER TERMS

Alphanumeric: Data in letter and number form.

ASCII: American Standard Code for Information Interchange. A code system which changes symbols and numbers into numeric values the computer can understand.

BASIC: Beginners All-purpose Symbolic Instruction Code. A very common programming language often used by beginners.

Baud: A measure of data transmission speed. A baud is equal to one bit per second. For example, 300 baud means a speed of 300 bits per second.

Binary number: A two-character number set using 0 and 1. Basic way information is represented in a computer.

Bit: The basic unit of computer data. A binary digit, either 0 or 1, in the binary system.

Boot: To load a program.

Buffer: Temporary storage to hold data for further processing.

Bug: An error in a program.

Byte: A group of bits thought of as a unit (usually 8-bits per byte). One byte is used to store each character of information.

CAI: Computer Assisted Instruction. Teaching using the computer as the instructional delivery system.

Cathode Ray Tube (CRT): The picture tube used to display computer output.

CD-ROM: Compact Disk-Read Only Memory. Extremely high density, mass storage for digital data on small disks read by laser (optical disks).

Central Processing Unit (CPU): The part of the computer which interprets and executes program instructions.

Chip: Integrated circuit made of silicon or other semiconductor material which holds thousands of microscopic circuits.

COBOL: Common Business Oriented Language. High–level language generally used in business applications.

Code: Translation of data into language the computer understands.

Command: Instructs the computer to perform a function.

Computer: An electronic device which processes data according to program instructions.

CPU: Central Processing Unit.

Crash: Hardware or software failure.

CRT: Cathode Ray Tube.

Cursor: The flashing marker on the monitor screen which shows where the next character will appear.

Data: Items of information (letters, numbers, symbols) generated or processed by the computer.

Database Management System: Software which enables related data to be organized and manipulated.

Debug: To eliminate errors in a computer or program.

Directory: A list of the files on a disk.

Disk: A flat, magnetic, circular device which stores bits of information and allows quick access.

Disk drive: A peripheral device which reads from or writes to disks.

Diskette: Another name for a 5-1/4 inch floppy disk.

Documentation: Written information on hardware or software which includes operating instructions.

DOS: Disk Operating System. A program that operates a disk drive.

Dot matrix printer: A printer which forms characters as patterns of tiny dots.

Electronic Mail: Personal or other messages transferred from one computer to others with a modem through phone lines.

File: Related data records collected under one name.

Floppy disk: A thin, flexible disk. Standard sizes are 3-1/2, 5-1/4 and 8 inch diameters.

Formatting: Processing of a disk into tracks and sectors which allows the computer to write or read to it.

FORTRAN: FORmula TRANslation. A high-level programming language used in mathematical and scientific applications.

Game paddle: Cursor control device used for computer games.

Graphics: Output in the form of images.

Hard copy: Computer output printed on paper.

Hard disk: Disk made of rigid material with a large storage capacity.

Hardware: The physical devices of a computer system--computer, disk drive, monitor, and printer.

High-level language: A programming language which allows the programmer to use natural language words which are translated into the machine language of zeros and ones. Examples: Pascal, BASIC.

Home computer: Microcomputer or personal computer.

Initialize: To format a blank disk for use or reset a computer system to begin a task.

Input: Any information from the keyboard, a disk or other input device entered into the computer.

Input device: A device used to enter information into a computer. Example: keyboard.

Input-Output: The process of entering or taking out data from a computer.

Integrated circuit: Semi-conductor material holding a complete electronic circuit. Also known as a chip.

Integrated software: Software which produces data compatible with other applications. Generally packaged with several application programs, e.g., word processing, database management and spreadsheet analysis.

Interface: A device or program that allows parts of a computer system to work together.

Jack: A connection or plug usually at the end of the cable or wire.

Joystick: A hand-held device which is used to control the cursor.

K: Abbreviation for kilo meaning 1000, usually used to describe quantity of memory equal to 1024 bytes. 48K means approximately 48,000 bytes of memory.

Language: Computer language which allows humans to communicate with a computer.

Load: To transfer a program of data from storage (disk) into the memory system of the computer.

Local Area Network (LAN): A data communication system which allows multiple computers, peripherals or terminals to share computer resources (such as in a school).

Logo: A high-level programming language. Often used with children, especially "turtle graphics."

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Memory: Internal circuitry in the computer which stores information for future use.

Memory Board: A peripheral which adds additional memory to a computer.

Microcomputer: A complete, small computer which conveniently fits on a desk or table.

Microprocessor: A single chip containing a central processing unit (CPU).

Modem: MOdulate/DEModulate. A device which allows computers to communicate over phone lines.

Mouse: A remote control input device used for a cursor.

Offline: Equipment not controlled by the main portion of the CPU of a computer system.

Online: Connected to a computer system.

Operating system: Programs controlling the basic operations of a computer system.

Output device: Any device used to take data out of a computer. Examples: printer, modem.

Parallel: Two or more functions happening at the same time. A parallel interface, for example, can send a number of bits simultaneously.

Pascal: A high-level programming language for general use and programming instruction named for French mathematician Blaise Pascal.

Peripheral: Any input/output hardware external to the computer itself. Most common are disk drives and printers.

Pixel: PIcture ELement. The basic unit used in the formation of video display images.

Power surge equipment: A device which shields computer systems from power fluctuations.

Power supply: A device that converts household current to the DC voltage used by a computer.

Printer: A device for producing paper copies (hard copy) of data output.

Program: Specified instructions which tell the computer what to do.

Public domain: Uncopyrighted software.

RAM: Random Access Memory.

Random Access Memory: The main type of memory used in a small computer. Through a RAM chip, the computer can retrieve or deposit information instantly. Information on a RAM chip is lost when the computer is turned off.

Read Only Memory: Memory with permanently stored information set during manufacturing.

RF Modulator: Radio Frequency Modulator. Device that turns computer output signals into radio frequencies to enable display on a standard television screen.

ROM: Read Only Memory.

RS-232C: Electrical standard for connecting a computer to data communication systems. Used for peripherals.

Save: Enter and store data on a disk.

Serial: Things occurring one after another. A serial interface reads in a byte one bit at a time.

Software: Input program on a disk which tells the computer what operations to perform.

Spreadsheet: Software which simulates a business or scientific worksheet enabling data to be manipulated. Example: VisiCalc.

System: All hardware components which make the computer usable including the computer, printer, disk drive, etc.

Word processor: A program which allows entry, manipulation, editing and storage of text.

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